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ABSTRACT

Part of an international study of the nature and extent of childhood mortality in geographically, socioeconomically and culturally disparate populations, this report focuses on (1) an investigation into all deaths of children under 5 years of age, and (2) a probability sample of live children within the same northern California area during an 18-month period. For the Mortality Component, data are provided on mortality rates, description of the population, birth history of the deceased infants and children, prenatal care, circumstances of death, causes of death, and Sudden Infant Death. In the Probability Sample of Live Children, emphasis is on descriptions of both mothers of children under 5 years of age and children under 5 years of age. Major recommendations are offered for state and local health departments assuming responsibility for the stimulation, planning, and conduct of community-wide research on prenatal, infant, and childhood mortality on an individual case basis; and for international collaborative studies. Specific suggestions are made regarding data recording methods, health care delivery systems, methods of care for high-risk newborns, studies of Sudden Infant Death, childhood accidents, maternal education, and immunization programs. (LH)

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Final Report

Inter-American Investigation of Mortality
in Childhood - California Study

REPORT

OF

STUDY OF INFANT AND CHILDHOOD MORTALITY

PS 005914

University of California School of Public Health, Berkeley
Maternal and Child Health Program

June 1972

University of California School of Public Health, Berkeley
Maternal and Child Health Program

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Inter-American Investigation of Mortality in Childhood
California Study

Chapter I: Introduction

In 1967 the Pan American Health Organization published Patterns of Urban Mortality,[1] the final results of an "Inter-American Investigation of Mortality." The report delineated causes of mortality among adults in twelve cities in the Americas during a two-year period. The main objective of the study was the elucidation of geographic and cultural differences in the epidemiology of disease to "contribute to the health and social well being" of the countries studied and to serve as a foundation for future research. One of the recommendations of the study was that a similar project be developed for the study of infant and childhood mortality. Consequently, a working group was formed in October 1966 to plan the development of an Inter-American Investigation of Mortality in Childhood.

Following a testing period of one year, the research program was initiated by the Pan American Health Organization to include fifteen projects in ten countries. The stated goals of this Childhood Mortality Study were clearly defined. The primary objective, as in the Adult Mortality Study, was to determine, accurately and comprehensively, the nature and extent of childhood mortality in geographically, socioeconomically and culturally disparate populations. Additional objectives, as defined by the study group, were:

-- To evaluate the effects of nutritional, sociological, and environmental factors on mortality

-- To compare the underlying and associated causes of death

-- To study the interrelationships of infectious diseases, nutritional deficiency states and socioeconomic factors

-- To analyze differences in environment in children who die and those who live

-- To provide substantive material which may contribute to the improvement of maternal and child health programs and education in participating countries.

The study was a collaborative one with each project accumulating data and forwarding it to the Pan American Health Organization headquarters in Washington, D.C. for analysis and future publication. Study results were to be published in a unified report. However, individual projects were free to further tabulate and analyze data to satisfy particular local needs and interests.

The United States' one participating project is located in the San Francisco Bay Area of California. The study, supported by the federal Maternal and Child Health Service, Rockville, Maryland, was conducted by the University of California School of Public Health, Berkeley, Maternal and Child Health Program. Canada has a study in Sherbrooke, Quebec, and Jamaica one in Kingston. The other twelve projects are located in Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, El Salvador, and Mexicc

The Pan American Health Organization Investigation of Mortality goals and objectives bear particular relevance to the health problems of the United States today, despite some differences in emphasis between the highly industrialized technology of the United States and the developing economy of the Latin American nations. In Latin American countries, mortality in early childhood is responsible for a high proportion of total deaths. The reduction of this mortality by 50 percent is one of the stated goals of the Alliance for Progress. Comparing Inter-American mortality rates in 1965, the infant death rates varied from 105.1 per 1,000 live births in Chile to 24.7 in the United States: the mortality rate for children 1 to 4 years of age varied from 26.9

per 1,000 population in Guatemala to 0.9 in the United States; deaths under 5 years of age accounted for 49 percent of all deaths in Guatemala in contrast to 6 percent in the United States. However, from the 1950's into the middle 1960's, the infant mortality rate of the United States had reached a plateau. In 1967, 1968, and 1969, despite an additional decrease, our infant mortality rate of 24.2 per 1,000 live births placed us fourteenth among the nations of the world.[2] However, the infant mortality rate in California in 1968, 18.7 per 1,000 live births, was considerably better than that of the nation as a whole and compared with the tenth ranked United Kingdom. Deaths during the neonatal period contribute heavily to the persistently unsatisfactory mortality rate in the United States: approximately 72 percent of all infant deaths occur during the first four weeks of life.[3] Newborns dying during the first 24 hours of life comprise 41 percent of all infant deaths. Furthermore, low birth weight infants, that is, babies weighing 2500 grams or less at birth, had a neonatal mortality rate of 174.0 per 1,000 live births compared to 7.4 for all other infants; low birth weight infants accounted for two-thirds of all neonatal deaths.

Socioeconomic status differentially affects pregnancy outcome and infant mortality, for example, the mortality rate for non-Whites is more than double that for Whites in the postneonatal period.[3,4] It has been estimated that 30 percent[3] of the infant deaths are attributable to identifiable environmental factors, many of which reflect the adequacy - or inadequacy - of the current health care system. The identification of high risk groups and provision of special services for them have become a primary concern of the federal government and health professionals. A closing of the gap between high and low risk groups, accompanied by even minor improvements in rates among the low risk groups, would result in a 10 percent reduction of the overall infant mortality rate.[3] The Maternity and Infant Care Projects, under Title V of the Social Security Act, represent such an

attempt by the federal government to identify and care for the high risk mother and her infant.

Variations in morbidity and mortality among different population segments continue throughout the preschool period. For example, the mortality rate among non-White children in 1965, age 1 to 4, was 1.6 per 1,000, that among White children 0.8 per 1,000.[3] Furthermore, the pattern of the leading causes of death among non-White children tends to resemble that of the White children of a decade earlier.

It is also a well known fact that health care services show tremendous variation in quality and accessibility. The Children and Yough Projects, funded by Title V of the Social Security Act, are an attempt to provide higher quality comprehensive care to low income groups of children and youth.

The University of California School of Public Health, Berkeley, Mortality Study was therefore undertaken with the following additional objectives:

-- To describe the causes and circumstances surrounding fatal illnesses of children under age 5
-- To profile the socio-cultural characteristics and family composition of a representative population sample to better understand the target population to which health and welfare services are directed
-- To examine the accuracy and completeness of vital records
-- To elucidate community needs in the field of maternal and child health programs
-- To identify high risk groups among infants and children
-- To examine patterns of health care within population subgroups.

The San Francisco Bay Area, in which our study is based, is located on the Pacific Coast of Northern California. The climate is moderate with temperatures averaging 50° to 60° throughout the year. The area includes two large cities, San Francisco and Oakland, both important commercial

centers and seaports. The population is heterogeneous, both ethnically and socioeconomically. San Francisco, for example, has the largest Chinese community outside Asia. Chicanos, or Mexican-Americans, and Japanese-Americans are also well represented. Non-Black minority groups account for 15.2 percent of the population and Blacks 13.4 percent. The 1970 total population of the San Francisco - Oakland Bay Area was 3,446,400.

The Bay Area is comprised of six autonomous counties, San Francisco, Alameda, Contra Costa, Marin, San Mateo, and Solano, to form the San Francisco - Oakland Standard Metropolitan Statistical Area (Appendix 1). Each county is self-administered, having an independent government and health department.

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Chapter II: Methodology

The Inter-American Investigation of Mortality in Childhood in the United States is composed of two main components: the Mortality Component, an investigation into all deaths of children under 5 years of age within the study area during a one-year period (June 1, 1969 - May 30, 1970), and the Live Child Component, a Probability Sample of Live Children within the same area during an eighteen month period, (June 1, 1969 - November 30, 1970).

The study area is entirely within the San Francisco - Oakland Standard Metropolitan Statistical Area and includes all of San Francisco County and the urban and more heavily populated suburban areas of three surrounding counties, San Mateo, Contra Costa, and Alameda. The total population covered by the study area is 2,751,000, dispersed over a 2,625 square mile area.

Mortality Study

The Childhood Mortality Component of the Inter-American Investigation involves the accumulation of data on all deaths of children under 5 years of age within the designated study area and time period (June 1, 1969 - May 30, 1970). Particular emphasis is placed on the social and biologic determinants of disease.

The University of California, Berkeley, Mortality Study was conducted by the Maternal and Child Health Program in the School of Public Health. Faculty members of the MCH Program served as staff members and consultants to the study. The study staff consisted of two Co-Principal Collaborators, who were faculty members of the Program, a Study Director, a Statistician, a secretary, a Statistical Clerk, and two Survey Workers.

In the University of California Project, county health departments were involved in the provision of birth and death certificates to the study. The

study staff met with health department personnel from each of the four participating counties, discussed the study with them, and made arrangements with them to provide the study with the necessary vital statistics. Ascertainment of cases was based on receipt of death certificates from each of these four county health departments. Alameda, Contra Costa, and San Mateo County Health Departments kept log books and forwarded relevant death certificates to the study office monthly, that is, the deaths that were of children under 5 years of age within the designated study area. The State of California Department of Health furnished a biannual listing of all deaths within the state by county name, and age at death; these listings were checked against death certificates received in the study office. Missing certificates were obtained and checked for admission into the study. Alameda County similarly publishes a biannual listing which served as an additional check for missing certificates. Arrangements with the San Francisco County Health Department were different: visits were made to the County Office of Vital Statistics every two months. Registers of deaths were checked and relevant death certificates obtained.

Upon receipt in the study office, death certificates were logged in a book, assigned a number and checked for eligibility into the Mortality Study by the study secretary. The address was checked to determine if it fell within the census tracts included in the study area. Date of birth and date of death were checked: the child had to be under 5 years of age at time of death and to have died within the study time period, June 1, 1969, to May 30, 1970, to be included in the study. Case numbers were assigned to deaths admitted into the study, their death certificates were checked for clerical errors, and a questionnaire containing information about the case was begun. Cases were then filed according to place of death. When approximately eight or ten cases had accumulated from the same hospital or geographic

area, a member of the study staff was assigned the collection of data for those cases. These staff members functioned as survey workers and statistical clerks: they made arrangements with hospitals, health departments, coroner's offices, and other health facilities, and abstracted information requested by the Mortality Study questionnaire.

The questionnaire used in the Mortality Component of the Inter-American Investigation of Mortality in Childhood was one drawn up by the Pan American Health Organization and modified by the University of California School of Public Health, Berkeley, to suit local needs and interests. Information contained in this questionnaire, known as the Mortality Questionnaire, fell into five broad categories: demographic data; reproductive history of mother, including course of pregnancy, labor, and delivery with study child: nutritional status of child; birth and medical history and events surrounding terminal illness; and an analysis of the cause of death. The questionnaire and a listing of variables coded from it are described in Appendices 2 and 3. Questions regarding accuracy of the death certificate and the preventability and responsibility for the death were added to the original P.A.H.O. form.

After all available data were abstracted from relevant records, the completed questionnaires were reviewed by the project director, a pediatrician, for completeness of data. He returned cases needing more information to the abstracters, who then attempted to obtain the additional information. In many cases, he contacted the child's physicians and discussed the case with them. In some cases, he interviewed the child's family in their home. When the case records contained as much information as was possible to obtain regarding the fatal illness and antecedent events, they were then summarized by the project director. Summaries consisted of a short case presentation. Summarized cases were evaluated at weekly conferences; these conferences were attended by pediatricians, obstetricians, pathologists, maternal and child health

division students, and other health professionals from university, county, and private hospitals. Each completed case was discussed and an underlying cause of death assigned by joint decision of the participating group. These conferences also served as teaching seminars for M.C.H. Division students. In addition, case material was made available to students for use in individual projects (Appendix 4).

The assignment of causes of death is one of the most important aspects of the study. Individual cases often carried several different diagnoses and causes of death as described separately by the clinical record, death certificate, autopsy report, and coroner's record. It was the task of this impartial group of physicians, which included a minimum of three pediatricians present, to consider all the information available and to assign as accurately as possible an underlying cause of death. The underlying cause of death is that condition which initiated the chain of events leading to death. Conditions such as "Immaturity" or "Postmaturity" or "Maceration" were used only if no underlying cause of death could be ascertained. Terminal conditions and syndromes were not considered as underlying causes of death. This procedure was evolved to insure a comprehensive detailed analysis of underlying causation of death in early childhood.

Data from the 898 deaths with assigned causes of death were coded by study staff and the code sheets sent for keypunching to the University of California, Berkeley, Computer Center. Data analysis was done by the study staff and involved the use of an I.B.M. 1130 Computer and Conversational Computer Statistical System (C.C.S.S.), a statistical program developed by Kronmal, Bender, and Mortenson,[5] available at the School of Public Health Computer Center.

Probability Sample of Live Children

The Probability Sample of Live Children was designed to provide baseline socioeconomic, biologic, and nutritional data on a population sample within the study area and to serve as a basis for comparing children who lived with those who died.

Sampling Procedure

A sampling procedure was used to give each household in the study area a probability of approximately 1/180 of appearing in the sample. The sample was drawn from two sources: city directories and areas not included in directories. City directories covered about 60% of the study area's population. All of the remaining study area was sampled by means of census tracts. Separate procedures were devised for city directory areas and for tract areas. For city directory areas a half-open interval procedure was used to take into account households in the area but not listed. Sample pages and lines were first selected. Blocks of thirty lines transcribed from the directories starting at the sample lines: these became sample clusters. Within each cluster, interviewers went to each household.

In census tract areas a three-stage procedure was used. In the first stage primary sampling units were selected. A block map of each PSU was drawn in such a way as to give a minimum block size of 40 households. From each PSU, four blocks were selected. Within these blocks, households were selected to give the desired sampling ratio.

To minimize the natural fluctuation of urban populations, the study period was divided into one-month intervals. Samples were drawn during each month and then combined to yield the total Live Child Probability Sample.

Based on estimates from the 1960 census figures, the sample was designed to yield approximately 1,000 children under the age of 5. In fact, rather than the anticipated 8.4 percent of the population, children under 5

comprised only 7.0 percent of the study area population. Four thousand homes were canvassed. 699 children fell into the study population.

The questionnaire used in the Probability Sample of Live Children known as the Live Child Questionnaire, was drawn up by the Pan American Health Organization and modified by the Berkeley study staff to fit local conditions. Interviews of selected households were conducted by members of the University of California Survey Research Center, Berkeley. Information requested from each household falls into five broad categories: household facilities and composition (demographic data), reproductive history of mother, feeding patterns, health care, and medical history of children under 5. The questionnaire and a listing of variables coded from it are described in Appendices 5 and 6. Questions pertaining to local concerns, such as health insurance and family planning practices, were added to the standard form.

Survey workers were recruited in February 1969, trained by a single individual, and began interviewing on June 1, 1969. They were closely supervised and a 10 percent call-back procedure used to check the reliability of the interviewers and the consistency of respondent's replies.

Data were coded and keypunched at the Survey Research Center. Meetings were held bimonthly by study staff and Center staff to monitor progress and supervise data collection.

The collection of data from the sample Live Child Study was completed in November, 1970, and covered an eighteen month period (June 1, 1969 through November 30, 1970).

CHAPTER III: MORTALITY COMPONENT

Study Population

The study area of the University of California School of Public Health, Berkeley, Childhood Mortality Project was divided up into two segments: one was comprised of San Francisco County, Study Area A, and the other of the urban and suburban portions of three surrounding counties, Alameda, Contra Costa, and San Mateo Counties, Study Area B. San Francisco County is primarily urban and has a total population of 715,674 people, 43,003 (6.0 percent) of whom are children under the age of 5. Alameda and Contra Costa Counties have a mixed rural, suburban, and urban population. The cities of Oakland and Berkeley, located in Alameda County have 117,000 and 362,000 people respectively; the city of Richmond, located in Contra Costa County has a population of 79,000. San Mateo County is primarily suburban and contains no large cities. The study population within Alameda, Contra Costa, and San Mateo Counties is 2,040,119, representing 93.2 percent of the total population in those counties. An estimated 161,575 children under the age of 5 (7.9 percent) reside in these three counties (Table 1). The population upon which the San Francisco-Oakland Bay Area component of the Inter-American Investigation of Mortality in Childhood is based is composed, therefore, of an estimated 2,755,793 people, representing 94.9 percent of the population in the four counties of Alameda, Contra Costa, San Francisco, and San Mateo. There are an estimated 204,578 children under the age of 5 in these four counties, comprising 7.4 percent of the population.

Population data for San Francisco County are taken directly from the 1970 United States Census. Figures for Alameda, Contra Costa, and San Mateo Counties are estimates based on 1970 Census material, since actual census data was not yet available at the time the study was completed. The State of California Department of Finance estimated individual census tract and total county populations prior to the 1970 Census. The proportion that each study area represented of the total county population was determined and that proportion applied to the actual total county population determined by the United States Census Bureau. Estimates for numbers of live births were obtained in a similar manner, using the numbers of live births tabulated by the State of California Department of Health for the time period June 1, 1969, to May 31, 1970.

San Francisco County had a birth rate of 15.8 per 1,000 population in 1970, and Study Area B (Alameda, Contra Costa, and San Mateo Counties) a birth rate of 16.4 per 1,000 population in 1970. Alameda County, the largest county in the study, had a birth rate of 17.0 in 1970 and thus contributed heavily to the overall birth rate of 16.2 per 1,000 population. Of the estimated 44,736 live births in the study area, 75.3 percent were White, 16.5 percent Black, and 8.2 percent Other races (Table 2). The category of Other races primarily includes Orientals, American Indians, Philippinos and Samoans.

During the one-year study period, June 1, 1969, through May 31, 1970, there were 898 deaths of children under 5 years of age within the study area. Neonates, age less than 28 days, comprised 63.5 percent (570 deaths) of these deaths; postneonates, age 28 days to 12 months, 23.7 percent (213 deaths); and preschoolers, age 1 to 4 years, 12.8 percent (115 deaths) (Table 3). It should be noted that in Table 3

as in all subsequent tables, percentages have been adjusted to add to 100.0 percent.

Mortality Rates

The infant mortality rate for the study area for 1969-70 was 17.5 per 1,000 live births. San Francisco County had a rate of 18.3 per 1,000 live births and Study Area B, 17.2 per 1,000 live births (Table 4). Alameda County had the highest rate, 18.6 per 1,000 live births and San Mateo County by far the lowest, 14.5 per 1,000 live births.

The neonatal mortality rate was 12.7 per 1,000 live births for the entire study area for 1969-70. San Francisco County had a rate of 12.9 per 1,000 live births compared to 12.7 for Study Area B. San Mateo County had the lowest rate 10.8 and Alameda County the highest 13.6 (Table 5).

The postneonatal mortality rate was 4.8 per 1,000 live births for the entire study area for 1969-70. San Francisco County had a rate of 5.4 per 1,000 live births, the highest of all four counties, compared to 4.5 per 1,000 for Study Area B. San Mateo County had the lowest postneonatal mortality rate, 3.7 per 1,000 live births (Table 6).

The mortality rate for children age 1 to 4 years in the study area was 0.7 per 1,000 population for 1969-70. San Francisco had a rate of 0.8 per 1,000 population and Study Area B 0.7 per 1,000. Contra Costa had the lowest rate, 0.5 deaths per 1,000 population and there was little variation among the other three counties (Table 7).

The Black mortality rates were significantly higher than those of the Whites among all three age groups. For example, the Black rate of 8.2 postneonatal deaths per 1,000 live births was exactly double the White rate of 4.1 deaths per 1,000 live births. Males had significantly

greater mortality rates during the first year of life due to the significantly greater neonatal mortality rate. However, sex differences in mortality rates were not significant during the preschool period (Table 8).

In summary, the mortality rates for the entire study area from June 1, 1969, through May 31, 1970, are:

Infant	17.5 per 1,000 live births
neonatal (less than 28 days)	12.7 per 1,000 live births
postneonatal (28 days to 11 months)	4.8 per 1,000 live births
Preschool	
1 to 4 years	0.7 per 1,000 population

The infant mortality rate of 17.5 per 1,000 live births for the study area compares favorably with the 1969 State of California rate of 18.3 per 1,000 live births and the 1970 National rate of 19.8 per 1,000 live births (Table 8). The postneonatal rate of 4.8 per 1,000 live births for the study area is identical to that of the State. The neonatal rate of 12.7 per 1,000 live births for the study area is lower than the State's rate of 13.6 per 1,000 live births. The neonatal mortality rate for the Nation was 14.9 per 1,000 live births, higher than the rates for both the study area and the State of California. Preschool mortality rates were similarly highest for the Nation, 0.9 per 1,000 population in 1968, and lowest for the study area, 0.7 per 1,000 population. The State preschool mortality rate was 0.8 per 1,000 population in 1969.

Other projects in the Inter-American Investigation of Mortality in Childhood report infant mortality rates for the central cities ranging from 91.5 per 1,000 live births (Recife, Brazil) to 42.7 per

1,000 live births (San Juan, Argentina). The median rate was 53.1 per 1,000 live births (Table 9).

Neonatal mortality rates for the 13 projects ranged from 19.1 per 1,000 live births (Medellin, Colombia) to 36.5 per 1,000 live births (San Juan, Argentina), with a median rate of 28.3 per 1,000 live births.

Mortality in preschool children, age 1 to 4 years, ranged from 1.1 per 1,000 population (San Juan, Argentina) to 10.1 per 1,000 population (Recife, Brazil) with a median of 4.4 per 1,000 population.

Table 1

Estimated Study Population by County for 1969-1970

County	Total Population	Population in Study Area	Percent of County Population in Study Area	Population in Study Area <1 yr. male	<1 yr. female	1 - 4 yrs. male	1 - 4 yrs. female	<5 yrs. total	Percent of Population Under Age 5
Alameda	1,073,184	1,010,639	94.2	8,314	8,069	31,950	30,722	79,055	7.8
Contra Costa	558,389	532,446	95.4	4,290	4,236	18,023	17,602	44,151	8.3
San Mateo	556,234	497,034	89.4	3,901	3,816	15,659	14,993	38,369	7.7
Subtotal	2,187,087	2,040,119	93.2	16,505	16,121	65,632	63,317	161,575	7.9
San Francisco	715,674	715,674	100.0	4,918	4,723	17,122	16,240	43,003	6.0
Total	2,903,481	2,755,793	94.9	21,423	20,844	82,754	79,557	204,578	7.4

Table 2

Estimated Live Births in Study Area by Race, Sex, and County in 1969-1970

County	White		Black		Other		Total	Birth Rate*
	#	%	#	%	#	%		
Alameda	12,819	74.7	3,415	19.9	919	5.4	17,153	17.0
Contra Costa	7,243	86.1	905	10.8	259	3.1	8,407	15.8
San Mateo	6,681	87.4	580	7.4	409	5.2	7,870	15.8
Subtotal	26,943	80.6	4,900	14.7	1,587	4.7	33,430	16.4
San Francisco	6,721	59.5	2,508	22.1	2,077	18.4	11,306	15.8
Total	33,664	75.3	7,408	16.5	3,664	8.2	44,736	16.2

*Number of Live Births Per 1,000 Population

Table 3

Age at Death by County in 1969-1970

County	Neonatal <28 days		Postneonatal 28 days - 1 yr.		Preschool 1-4 yrs.		Total	
	#	%	#	%	#	%	#	%
Alameda	231	64.0	85	23.5	45	12.5	361	100.0
Contra Costa	106	65.0	38	23.3	19	11.7	163	100.0
San Mateo	86	61.4	29	20.7	25	17.9	140	100.0
San Francisco	147	62.8	61	26.1	26	11.1	234	100.0
Total	570	63.5	213	23.7	115	12.8	898	100.0

Table 4

Infant Deaths

Number and Rate Per 1,000 Live Births by Race, Sex, and County in Study Area in 1969-1970

Race	Sex	Alameda County		Contra Costa County		San Mateo County		(Study Area B) Other Counties Combined		(Study Area A) San Francisco County		Total	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
White	male	125	19.3	72	19.2	58	16.5	255	18.5	64	18.4	319	18.5
	female	78	12.3	44	12.7	43	12.8	165	12.5	45	13.9	210	12.8
	total	203	15.9	116	16.1	101	14.7	420	15.6	109	16.2	529	15.7
Black	male	62	36.0	19	42.3	6	19.8	87	35.1	40	31.0	127	33.7
	female	43	25.5	4	8.8	5	18.2	52	21.5	34	27.9	86	23.6
	total	105	30.8	23	25.5	11	19.0	139	28.4	74	29.5	213	28.8
Other	male	3	6.5	3	24.0	0	-	6	7.5	17	15.7	23	12.2
	female	7	15.3	2	15.0	2	10.6	11	14.1	7	7.0	18	10.1
	total	10	10.9	5	19.3	2	4.9	17	10.7	24	11.6	41	11.2
Total	male	190	22.0	94	21.7	64	15.9	348	20.4	121	20.7	469	20.5
	female	128	15.1	50	12.3	50	13.1	228	13.9	86	15.8	314	14.4
	total	318	18.6	144	17.2	114	14.5	576	17.2	207	18.3	783	17.5

Table 5

Neonatal Deaths

Number and Rate Per 1,000 Live Births by Race, Sex, and County in Study Area in 1969-1970

Race	Sex	Alameda County		Contra Costa County		San Mateo County		(Study Area B) Other Counties Combined		(Study Area A) San Francisco County		Total	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
White	male	95	14.7	57	15.1	40	11.4	192	14.0	50	14.4	242	14.0
	female	50	7.9	28	8.0	34	10.1	112	8.5	36	11.1	148	9.0
	total	145	11.3	85	11.7	74	10.8	304	11.3	86	12.8	390	11.6
Black	male	49	28.4	13	28.9	6	19.7	68	27.4	27	20.9	95	25.2
	female	34	20.1	3	6.6	3	10.9	40	16.5	17	14.0	57	15.7
	total	83	24.3	16	17.7	9	15.5	108	22.0	44	17.5	152	20.5
Other	male	0	-	3	24.0	0	-	3	3.7	12	11.1	15	7.9
	female	5	10.9	2	14.9	2	10.5	9	11.5	4	4.0	13	5.1
	total	5	5.4	5	19.3	2	4.9	12	7.6	16	7.7	28	7.6
Total	male	144	16.6	73	16.8	46	11.4	263	15.4	89	15.2	352	15.4
	female	89	10.5	33	8.1	39	10.2	161	9.8	57	10.5	218	10.0
	total	233	13.6	106	12.6	85	10.8	424	12.7	146	12.9	570	12.7

Table 6

Postneonatal Deaths

Number and Rate Per 1,000 Live Births by Race, Sex, and County in Study Area in 1969-1970

Race	Sex	Alameda County		Contra Costa County		San Mateo County		(Study Area B) Other Counties Combined		(Study Area A) San Francisco County		Total	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
White	male	30	4.6	15	4.0	18	5.1	63	4.6	14	4.0	77	4.5
	female	28	4.4	16	4.6	9	2.7	53	4.0	9	2.8	62	3.8
	total	58	4.5	31	4.3	27	3.9	116	4.3	23	3.4	139	4.1
Black	male	13	7.5	6	13.3	0	-	19	7.7	13	10.1	32	8.5
	female	9	5.3	1	2.2	2	7.2	12	5.0	17	14.0	29	8.0
	total	22	6.4	7	7.7	2	3.4	31	6.5	30	12.0	61	8.2
Other	male	3	6.5	0	-	0	-	3	3.7	5	4.6	8	4.2
	female	2	4.4	0	-	0	-	2	2.6	3	3.0	5	2.8
	total	5	5.4	0	-	0	-	5	3.2	8	3.9	13	3.5
Total	male	46	5.3	21	4.8	18	4.5	85	5.0	32	5.5	117	5.1
	female	39	4.6	17	4.2	11	2.9	67	4.1	29	5.3	96	4.4
	total	85	5.0	38	4.5	29	3.7	152	4.5	61	5.4	213	4.8

Table 7

Preschool Deaths

Number and Rate Per 1,000 Population by Race, Sex, and County in Study Area in 1969-1970

Race	Sex	Alameda County		Contra Costa County		San Mateo County		(Study Area B) Other Counties Combined		(Study Area A) San Francisco County		Total	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
White	male	23	0.9	7	0.4	13	0.9	43	0.8	7	0.7	50	0.8
	female	9	0.4	8	0.5	8	0.6	25	0.5	5	0.5	30	0.5
	total	32	0.7	15	0.5	21	0.8	68	0.6	12	0.6	80	0.6
Black	male	4	0.7	1	0.6	1	1.0	6	0.7	9	2.4	15	1.2
	female	8	1.4	2	1.2	1	1.0	11	1.3	2	0.5	13	1.1
	total	12	1.0	3	0.9	2	1.0	17	1.0	11	1.5	28	1.1
Other	male	1	0.5	0	-	0	-	1	0.3	3	0.9	4	0.6
	female	0	-	1	1.7	2	2.5	3	1.0	0	-	3	0.5
	total	1	0.3	1	0.9	2	1.2	4	0.6	3	0.5	7	0.5
Total	male	28	0.9	8	0.4	14	0.9	50	0.8	19	1.1	69	0.8
	female	17	0.6	11	0.6	11	0.7	39	0.6	7	0.4	46	0.6
	total	45	0.7	19	0.5	25	0.8	89	0.7	26	0.8	115	0.7

Table 8

Comparison of Infant Death Rates of Mortality Study, 1969-1970, the State of California, 1969, and the United States, 1970

	United States, 1970[1]			State of California, 1969[2]				Mortality Study, 1969-1970			
	White	All Others	Total	White	Black	Other	Total	White	Black	Other	Total
Infant	17.4	31.4	19.8	17.6	29.1	9.3	18.3	15.7	28.8	11.2	17.5
neonatal	13.5	21.6	14.9	13.2	19.9	7.5	13.6	11.6	20.5	7.6	12.7
postneonatal	3.9	9.8	4.9	4.4	9.4	1.8	4.8	4.1	8.2	3.5	4.8

[1] Source: Annual Summary for the United States, 1970, Vol. 19:13, September 1971. United States Dept. of Health, Education, and Welfare.

[2] Source: State of California, Department of Public Health, Maternal and Child Health

Table 9

Infant, Neonatal, and Preschool Mortality Rates
in the Inter-American Investigation of Mortality in Childhood*

Project	Mortality Rate		
	Infant	Neonatal[1]	Preschool[2]
Cali	53.1	24.0	6.2
Cartagena	48.0	23.2	4.7
Kingston	41.9	26.4	2.2
La Paz	76.3	32.7	9.6
Medellin	46.3	19.1	5.9
Monterrey	57.7	25.9	3.9
Recife	91.5	34.4	10.1
Resistencia-Chaco	76.0	30.2	4.4
Ribeirao Preto	46.9	30.4	2.4
San Juan	42.7	36.5	1.1
San Salvador	76.7	28.3	6.3
Santiago	50.5	19.6	1.8
Sao Paulo	69.0	34.8	2.8
United States	17.5	12.7	0.7

*Source: Inter-American Investigation of Mortality in Childhood. Provisional Report, September, 1971, Pan American Health Organization, pages 32, 45, 48.

[1] Deaths per 1,000 live births

[2] Deaths per 1,000 population

DESCRIPTION OF MORTALITY STUDY POPULATION

Certain demographic and reproductive characteristics of the mothers of the 898 deceased children were analyzed by the University of California School of Public Health, Berkeley, Inter-American Investigation of Mortality in order to better understand the causes of mortality in children under 5 years of age.

Maternal Age

Maternal age at the time of the birth of the study child* varied from 14 to 45 years with a mean age of 24.8 years. Mothers over 40 years of age accounted for 2.6 percent of the children, and those under 20 years of age for 20.2 percent of the children (Table 10). The mean age of Black mothers of deceased children was 23.2 years, a statistically significant difference from the mean age of White mothers of 25.2 years. All other races had a mean maternal age of 27.2 years. Mean maternal age by county is contained in Appendix 7.

Table 10

Deaths By Age of Mother At Birth of Child In Study

Age of Mother	Number of Childhood Deaths	Percent of Total Deaths
14 to 19 years	181	20.2
20 to 24 years	293	32.6
25 to 29 years	216	24.0
30 to 34 years	110	12.2
35 to 39 years	41	4.6
40 years & over	23	2.6
unknown	34	3.8
Total	898	100.0

Paternal Age

Age of fathers at time of birth of the child varied from 16 to 71 years, with a mean age of 28.2 years. Fathers under 20 years of age accounted for 7.1 percent, and those over 40 years for 7.6 percent (Table 11). The mean age of Black fathers of deceased children (26.6 years) was significantly lower than that of White fathers (28.5 years) and that of fathers of all other races (31.8 years). Mean paternal age by county is contained in Appendix 8.

Table 11

Deaths By Age of Father At Birth of Child In Study

Age of Father	Number of Deaths	Percent of Total Deaths
15 to 19 years	64	7.1
20 to 24 years	234	26.1
25 to 29 years	230	25.6
30 to 34 years	139	15.5
35 to 39 years	79	8.8
40 to 44 years	43	4.8
45 to 49 years	13	1.4
50 years & over	13	1.4
unknown	83	9.3
Total	898	100.0

Maternal Marital Status

Marital status of the mothers of deceased children was divided into four categories: Married to the father of the child, Single, "Other", and Unknown. If the names of the father and the mother of the child were identical as given by the birth certificate, then maternal status was coded as Married to the father of the child. If mother's

and father's names did not match on the birth certificate, or, in those fewer instances, where no father's name was given, maternal marital status was coded as Single. Where parental names did not match but either the birth certificate or hospital records indicated that the mother was presently or previously had been married, marital status was coded as "Other". The category of "Unknown" was reserved for those cases in which a discrepancy existed between information given by birth certificate and hospital or other medical records. There were 96 such cases (10.7 percent) in which the maternal marital status could not be clearly ascertained. Only 10.7 percent of the mothers were definitively classified as Single at the birth of the child, and 75.6 percent classified as Married to the father of the child (Table 12).

Table 12

Marital Status of Mothers of Deceased Children in Study

Marital Status	Number	Percent of Total Deaths
Married to father of child	679	75.6
Single	96	10.7
Other	27	3.0
Unknown	96	10.7
Total	898	100.0

Birth Order

Deceased children were the firstborn in 32.1 percent of the cases. They were the fifth born or higher in 8.6 percent of the cases (Table 13). Birth orders ranged from the stated low of 1 to a high of 12, with a mean of 2.4. There was no significant differ-

ence between the mean birth order for White children (2.4) and that for Black children (2.5). Mean birth order and range of parity by county are contained in Appendix 9.

Table 13

Birth Order of Deceased Children in Study

Birth Order	Number	Percent of Total
1	288	32.1
2	246	27.4
3	163	18.1
4	77	8.6
5 & over	77	8.6
unknown	47	5.2
Total	898	100.0

Father's Occupation

The following distribution of occupation of the father was found (Table 14).

Table 14

Deaths By Occupation of Fathers of Deceased Children in Study

Occupation	Number	Percent of Total
Professional	162	18.1
Skilled	149	16.6
Semiskilled	108	12.0
Unskilled	90	10.0
Military	77	8.6
Service	72	8.0
Clerical	56	6.2
Student	43	4.8
Unemployed	36	4.0
Unknown	105	11.7
Total	898	100.0

BIRTH HISTORY OF DECEASED CHILDREN

Hospital of Birth

The hospitals at which the study children were born were divided into two categories: tax-supported and non-tax-supported. County, military, and university hospitals were considered as tax-supported. Private, including pre-payment plan hospitals, were classed as non-tax-supported. There were 267 children born in tax-supported hospitals, 548 in non-tax-supported institutions, and 64 born in institutions outside the study area or born out of hospital (Table 15).

Table 15

Types of Hospitals in Which Deceased Children in Study Were Born

	Number	Percent
Non-tax-supported:		
non-profit	538	59.9
profit	10	1.1
Tax-supported	267	29.7
Outside Study Area	58	6.5
Not in Hospital	6	0.7
Unknown	19	2.1
Total	898	100.0

Initiation of Prenatal Care

The trimester during which prenatal care was initiated is listed in Table 16. Thirty-two mothers or 5.6 percent were known to have had no prenatal care. There were 19 mothers who were known to have prenatal care but the time at which such care began is unknown.

Table 16

Trimester During Which Prenatal Care of Mother Was Initiated By Age At Death of Child

Trimester	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
First	324	56.9	103	48.4	48	41.7	475	52.9
Second	142	24.9	61	28.6	28	24.4	231	25.7
Third	22	3.9	12	5.6	7	6.1	41	4.6
Care Received (Time Unknown)	19	3.3	8	3.8	6	5.2	33	3.7
No Care	32	5.6	10	4.7	4	3.5	46	5.1
Unknown	31	5.4	19	8.9	22	19.1	72	8.0
Total	570	100.0	213	100.0	115	100.0	898	100.0

Abnormal Conditions During Pregnancy

In this study, abnormal conditions of pregnancy refer to toxemia, anemia, and antepartum hemorrhage. The category of toxemia includes all those women who were noted to have any of the following: edema and albuminuria, hypertension, or convulsions. The determination of the presence of maternal anemia or antepartum hemorrhage was based on a diagnosis carried by the hospital record, and according to the P.A.H.O. definition, was not dependent upon either hemoglobin levels or blood loss. Antepartum hemorrhage includes threatened abortion and placenta previa. Marginal sinus hemorrhages and abruptio placenta were not included in this category (Table 17). Other conditions during pregnancy about which the questionnaire specifically elicited information were Rubella, syphilis, pulmonary tuberculosis, operations, trauma, and other infectious diseases. There were few cases of each of these, a tabulation of which is contained in Appendix 10, as is a finer breakdown of the other abnormal conditions of pregnancy (Appendix 11).

Table 17

Abnormal Conditions During Pregnancy of Mother By Age At Death* of Study Child

Conditions	Neonatal #	Postneonatal #	Preschool #
Toxemia	33	7	4
Anemia	13	2	2
Antepartum Hemorrhage	35	5	1

*The tabulations of different conditions within this table are not mutually exclusive, that is, the same mother may be counted under more than one condition.

Delivery, Type and Use of Medication

Information concerning the mode of delivery of the study child concerned the use of forceps, anesthesia, and sedation of the mother during labor and delivery (Table 18).

Table 18

Delivery Information on Mother By Age At Death of Child

Mode of Delivery	Neonatal #	Neonatal %	Postneonatal #	Postneonatal %	Preschool #	Preschool %	Total #	Total %
Spontaneous	336	58.9	109	51.2	48	41.7	493	54.9
Forceps	106	18.6	47	22.1	25	21.7	178	19.8
Cesarean	78	13.7	15	7.0	5	4.4	98	10.9
Unknown	50	8.8	42	19.7	37	32.2	129	14.4
TOTAL	570	100.0	213	100.0	115	100.0	898	100.0
Medication:								
Anesthesia	356		101		41		498	
Sedation	223		63		23		309	

Birth Weight

As anticipated, the incidence of low birth weight infants was very high among those children subsequently dying during the first five years of life. Infants weighing 2500 grams or less at birth comprised 56.5 percent of the total 898 births. They accounted for 77.5 percent of the neonatal deaths, 24.4 percent of the postneonatal deaths and 11.3 percent of the preschool deaths. Infants weighing 1000 grams or less at birth accounted for 20.8 percent of the total 898 deaths (Table 19).

Table 19

Birth Weight By Age At Death

Birth Weight	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
500 gms. or less	31	5.4	0	-	0	-	31	3.5
501 to 1000 gms.	155	27.2	0	-	0	-	155	17.3
1001 to 1500 gms.	120	21.1	10	4.7	0	-	130	14.5
1501 to 2000 gms.	74	13.0	15	7.0	3	2.6	92	10.2
2001 to 2500 gms.	62	10.9	27	12.7	10	8.7	99	11.0
Total 2500 gms. or less	442	77.6	52	24.4	13	11.3	507	56.5
2501 to 3000 gms.	45	7.9	50	23.5	26	22.6	121	13.5
3001 to 3500 gms.	45	7.9	59	27.7	29	25.2	133	14.8
3501 to 4000 gms.	24	4.2	28	13.1	28	24.4	80	8.9
over 4000 gms.	12	2.1	17	8.0	6	5.2	35	3.9
Unknown	2	0.3	7	3.3	13	11.3	22	2.4
Total	570	100.0	213	100.0	115	100.0	898	100.0

Length of Gestation Period

Length of gestation period was calculated on the basis of last menstrual period (L.M.P.) as noted on the birth certificate. Four hundred and fifty-nine children (51.1 percent) were of low gestation, that is, less than 38 weeks, according to the classification of Yerushalmy[6] (Table 20).

Table 20

Length of Gestation By Age At Death

Gestation	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Less than 30 weeks	211	37.0	6	2.8	0	-	217	24.2
30 to 33 weeks	108	19.0	16	7.5	2	1.7	126	14.0
34 to 37 weeks	76	13.3	35	16.4	5	4.3	116	12.9
Total less than 38 weeks	395	69.3	57	26.8	7	6.1	459	51.1
38 to 41 weeks	138	24.2	116	54.5	77	67.0	331	36.9
42 weeks and over	17	3.0	19	8.9	8	7.0	44	4.9
Unknown	20	3.5	21	9.9	23	20.0	64	7.1
Total	570	100.0	213	100.0	115	100.0	898	100.0

Condition at Birth

The general state of the newborn was noted as good, fair, poor or unknown, according to the hospital record designation. There were 371 children (41.3 percent) of the total 898, whose condition at birth was listed as poor (Table 21).

Table 21

Condition At Birth By Age At Death

Condition	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Good	92	16.1	115	54.0	66	57.4	273	30.4
Fair	98	17.2	24	11.3	3	2.6	125	13.9
Poor	354	62.1	15	7.0	2	1.7	371	41.3
Unknown	26	4.6	59	27.7	44	38.3	129	14.4
Total	570	100.0	213	100.0	115	100.0	898	100.0

Congenital Anomalies Noted At Birth

Among the 898 deaths included in the study, 112 or 12.5 percent had at least one congenital anomaly noted at birth. Thirty-seven of these children (33.0 percent) had two or more congenital anomalies diagnosed at birth.

LOW BIRTH WEIGHT AMONG DECEASED INFANTS AND CHILDREN

Low birth weight infants* comprised 56.5 percent of all deaths of infants and children under 5 years of age during the one-year period within the study area. This high risk group of newborns accounted for 77.6 percent of the neonatal deaths, 24.4 percent of the post-neonatal deaths, and 11.3 percent of the deaths in children 1-4 years of age. Since accurate figures for the incidence of low birth weight within the study area are not available, the following analysis of data is based on comparisons of low birth weight incidence in different subgroups of the population of deceased children.

Among the 898 deaths of children under 5 years of age, 507 of them (56.5 percent) weighed 2500 grams or less at birth. There were 316 infants weighing 1500 grams or less at birth accounting for 63.2 percent of the infants weighing 2500 grams or less at birth and comprising 35.2 percent of the population of deceased children (Table 23).

Race

A significantly greater proportion of Blacks (63.1 percent) than of Whites (54.0) were of low birth weight. In addition, of the low birth weight infants, a significantly higher percentage of Blacks (71.1 percent) than of Whites (58.1 percent) weighed 1500 grams or less. Males and females did not differ significantly in distribution of birth weight: 57.2 percent of the females and 55.9 percent of the males weighed 2500 grams or less at birth. Differences by sex were not significant among any of the groups.

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*Weighing five and a half pounds or less at birth.

Infants dying during the neonatal period had the greatest proportion of infants of very low birth weight (1500 grams or less), 53.7 percent, compared to 4.7 percent among those dying during the postneonatal period and none dying during the preschool years (Tables 24, 25, 26). Blacks and other non-white races had a significantly greater proportion of very low birth weight infants dying during the neonatal period than did Whites, 68.4 percent and 60.7 respectively, compared to 47.4 percent. Females predominated among deceased neonates weighing 1500 grams or less at birth.

In the postneonatal period, Blacks had a significantly greater proportion of low birth weight infants than Whites, 36.1 percent compared to 19.4 percent. The proportion of infants weighing 1500 grams or less was, however, not significantly greater among deceased Black postneonates.

The percent of deceased preschoolers who were of low birth weight, 11.3 percent of the total, did not vary significantly between racial groups.

Table 23

Number and Percent of Deaths in the First 5 Years of Life
By Race, Sex, and Birth Weight

Number of Deaths

Birth Weight	White			Black			Other			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
1500 gms or less	109	82	191	64	44	108	8	9	17	181	135	316
1501 to 2500 gms.	90	48	138	26	18	44	4	5	9	120	71	191
2501 to 4500 gms.	155	103	258	49	35	84	13	7	20	217	145	362
Over 4500 gms.	3	3	6	0	1	1	0	0	0	3	4	7
Unknown	12	4	16	3	1	4	2	0	2	17	5	22
Total	369	240	609	142	99	241	27	21	48	538	360	898

Percent

Birth Weight	White			Black			Other			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
1500 gms. or less	29.5	34.2	31.3	45.1	44.4	44.8	29.6	42.9	35.4	33.6	37.5	35.2
1501 to 2500 gms.	24.4	20.0	22.7	18.3	18.2	18.3	14.8	23.8	18.7	22.3	19.7	21.3
2501 to 4500 gms.	42.0	42.9	42.4	34.5	35.4	34.8	48.2	33.3	41.7	40.3	40.3	40.3
Over 4500 gms.	0.8	1.2	1.0	-	1.0	0.4	-	-	-	0.6	1.1	0.8
Unknown	3.3	1.7	2.6	2.1	1.0	1.7	7.4	-	4.2	3.2	1.4	2.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 24

Number and Percent of Neonatal Deaths by Race, Sex, and Birth Weight

Number of Deaths

Birth Weight	White			Black			Other			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
1500 gms. or less	107	78	185	63	41	104	8	9	17	178	128	306
1501 to 2500 gms.	73	36	109	15	7	22	3	2	5	91	45	136
2501 to 4500 gms.	61	33	94	16	8	24	3	2	5	80	43	123
Over 4500 gms.	1	1	2	0	1	1	0	0	0	1	2	3
Unknown	0	0	0	1	0	1	1	0	1	2	0	2
Total	242	148	390	95	57	152	15	13	28	352	218	570

Percent

Birth Weight	White			Black			Other			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
1500 gms. or less	44.2	52.7	47.4	66.3	71.9	68.4	53.3	69.2	60.7	50.6	58.7	53.7
1501 to 2500 gms.	30.2	24.3	28.0	15.8	12.3	14.4	20.0	15.4	17.9	25.8	20.7	23.9
2501 to 4500 gms.	25.2	22.3	24.1	16.8	14.0	15.8	20.0	15.4	17.9	22.7	19.7	21.6
Over 4500 gms.	0.4	0.7	0.5	-	1.8	0.7	-	-	-	0.3	0.9	0.5
Unknown	-	-	-	1.1	-	0.7	6.7	-	3.5	0.6	-	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 25

Number and Percent of Postneonatal Deaths by Race, Sex, and Birth Weight

Number of Deaths

Birth Weight	White male	White female	White total	Black male	Black female	Black total	Other male	Other female	Other total	Total male	Total female	Total total
1500 gms. or less	2	4	6	1	3	4	0	0	0	3	7	10
1501 to 2500 gms.	11	10	21	7	11	18	1	2	3	19	23	42
2501 to 4500 gms.	59	47	106	23	15	38	6	3	9	88	65	153
Over 4500 gms.	0	1	1	0	0	0	0	0	0	0	1	1
Unknown	5	0	5	1	0	1	1	0	1	7	0	7
Total	77	62	139	32	29	61	8	5	13	117	96	213

Percent

Birth Weight	White male	White female	White total	Black male	Black female	Black total	Other male	Other female	Other total	Total male	Total female	Total total
1500 gms. or less	2.6	6.5	4.3	3.1	10.4	6.6	-	-	-	2.6	7.3	4.7
1501 to 2500 gms.	14.3	16.1	15.1	21.9	37.9	29.5	12.5	40.0	23.1	16.2	24.0	19.7
2501 to 4500 gms.	76.6	75.8	76.3	71.9	51.7	62.3	75.0	60.0	69.2	75.2	67.7	71.8
Over 4500 gms.	-	1.6	0.7	-	-	-	-	-	-	-	1.0	0.5
Unknown	6.5	-	3.6	3.1	-	1.6	12.5	-	7.7	6.0	-	3.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 26

Number and Percent of Preschool Deaths By Race, Sex, and Birth Weight

Number of Deaths

Birth Weight	White			Black			Other			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
1500 gms. or less	0	0	0	0	0	0	0	0	0	0	0	0
1501 to 2500 gms.	6	2	8	4	0	4	0	1	1	10	3	13
2501 to 4500 gms.	35	23	58	10	12	22	4	2	6	49	37	86
Over 4500 gms.	2	1	3	0	0	0	0	0	0	2	1	3
Unknown	7	4	11	1	1	2	0	0	0	8	5	13
Total	50	30	80	15	13	28	4	3	7	69	46	115

Percent

Birth Weight	White			Black			Other			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
1500 gms. or less	-	-	-	-	-	-	-	-	-	-	-	-
1501 to 2500 gms.	12.0	6.7	10.0	26.7	-	14.3	-	33.3	14.3	14.5	6.5	11.3
2501 to 4500 gms.	70.0	76.7	72.5	66.7	92.3	78.6	100.0	66.7	85.7	71.0	80.4	74.8
Over 4500 gms.	4.0	3.3	3.7	-	-	-	-	-	-	2.9	2.2	2.6
Unknown	14.0	13.3	13.8	6.6	7.7	7.1	-	-	-	11.6	10.9	11.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Maternal Age

The occurrence of low birth weight among deceased infants was significantly related to maternal age. Mothers 40 years of age and over had the grestest proportion of low birth weight infants, 69.6 percent. Mothers under 20 years of age had the next highest proportion of low birth weight infants (66.3 percent) (Table 27).

Table 27

Number and Percent of Low Birth Weight Infants Among Deceased Children by Maternal Age

Maternal Age	Birth Weight: 1500 grams and under		1501-2500 grams		2501 grams and over		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%
14 to 19 years	89	49.2	31	17.1	61	33.7	0	-	181	100.0
20 to 24 years	92	31.4	76	25.9	124	42.3	1	0.4	293	100.0
25 to 29 years	70	32.4	46	21.3	100	46.3	0	-	216	100.0
30 to 34 years	40	36.4	20	18.2	46	41.8	4	3.6	110	100.0
35 to 39 years	13	31.7	9	22.0	19	46.3	0	-	41	100.0
40 years & over	10	43.5	6	26.1	17	30.4	0	-	23	100.0
unknown	2	5.9	3	8.8	12	35.3	17	50.0	34	100.0
Total	316	35.2	191	21.3	369	41.1	22	2.4	898	100.0

Maternal Parity

Maternal parity was not significantly associated with frequency of low birth weight among deceased infants in this study (Table 28).

Table 28

Number and Percent of Low Birth Weight Infants
Among Deceased Children by Maternal Parity

Parity	Birth Weight: 1500 grams and under #	%	1501-2500 grams #	%	2501 grams and over #	%	Unknown #	%	Total #	%
1	106	36.9	60	20.9	119	41.5	2	0.7	287	100.0
2	99	40.1	42	17.0	105	42.5	1	0.4	247	100.0
3	53	32.7	40	24.7	68	42.0	1	0.6	162	100.0
4	24	31.2	20	26.0	32	41.5	1	1.3	77	100.0
5 & Over	25	32.1	21	26.9	31	39.7	1	1.3	78	100.0
Unknown	9	19.2	8	17.0	14	29.8	16	34.0	47	100.0
Total	316	35.2	191	21.3	369	41.1	22	2.4	898	100.0

Father's Occupation

Occupation of the fathers of the 898 deceased children was assigned to one of three categories: I, II, and III. The White collar professions were grouped in category I, i.e. professional and clerical. Blue collar workers, skilled and semi-skilled were classed in category II, and service and unskilled employees were grouped in category III. The unemployed, students, and military personnel were omitted from this analysis. The differences in the percent of low birth weight infants between each of the three groups were not statistically significant (Table 29).

Table 29

Number and Percent of Infants of Low Birth Weight Among Deceased Children By Father's Occupation

Occupation	Birth Weight: 2500 grams of less #	%	2501 grams and over #	%	Total #	%
I	118	55.4	95	44.6	213	100.0
II	150	59.3	103	40.7	253	100.0
III	92	57.1	69	42.9	161	100.0
Total	360	57.4	267	42.6	627	100.0

Abnormal Conditions During Pregnancy

Mothers with the group of abnormal conditions related to pregnancy had significantly greater incidence of low birth weight infants. These conditions included toxemia, anemia, antepartum hemorrhage, abruptio placenta and others (Table 30). In contrast, the incidence of low birth weight was not significantly increased among those mothers whose abnormalities were unrelated to the pregnancy (Table 31). A finer breakdown of these conditions is found in Appendix 12.

Table 30

Number and Percent of Low Birth Weight Infants Among Mothers of Deceased Children by Presence of Abnormal Conditions Related to Pregnancy

Abnormal Conditions Related to Pregnancy	Birth Weight: 2500 grams and less #	%	2501 grams and over #	%	Total #	%
1 or more	263	78.7	71	21.3	334	100.0
none	199	42.0	275	58.0	474	100.0
Total	462	57.2	346	42.8	808	100.0

Table 31

Number and Percent of Low Birth Weight Infants Among Mothers of Deceased Children By Presence of Abnormal Conditions Unrelated to Pregnancy

Abnormal Conditions Unrelated to Pregnancy	Birth Weight					
	2500 grams and less		2501 grams and over		Total	
	#	%	#	%	#	%
1 or More	68	61.8	42	38.2	110	100.0
none	367	55.4	296	44.6	663	100.0
Total	435	56.3	338	43.7	773	100.0

PRENATAL CARE

The trimester during which mothers of deceased children began prenatal care was compared among different groups. Although there was some indication of trends, the numbers were too small to draw conclusions. Initiation of prenatal care by race, maternal age, parity and marital status, father's occupation, and abnormal conditions related to pregnancy, are contained in Appendices 13, 14, 15, 16, 17, 18.

CIRCUMSTANCES OF DEATH

Onset of Terminal Illness

The questionnaire contained information regarding the terminal illness of each child. Information coded included age at onset of illness, interval recorded between onset of illness and time of death, and how illness started. Among the 898 deaths, 538 (94.4 percent) of the neonates, 35 (16.4 percent) of the postneonates, and 20 (17.4 percent) of the preschoolers died of illness which began at birth. Of the postneonatal deaths, 79.8 percent were to children whose illnesses began sometime during the postneonatal period (Table 32).

Table 32

Age At Onset Of Illness By Age At Death

Age at Onset of Illness	Age At Death: Neonatal #	Neonatal %	Postneonatal #	Postneonatal %	Preschool #	Preschool %	Total #	Total %
Birth	538	94.4	35	16.4	20	17.4	593	66.0
1 day to 6 days	12	2.1	1	0.5	0	-	13	1.4
7 days to 27 days	20	3.5	7	3.3	0	-	27	3.0
28 days to 1 year	0	-	170	79.8	12	10.4	182	20.3
1 year to 2 years	0	-	0	-	27	23.5	27	3.0
2 years to 3 years	0	-	0	-	23	20.0	23	2.6
3 years to 4 years	0	-	0	-	15	13.0	15	1.7
4 years to 5 years	0	-	0	-	18	15.7	18	2.0
Total	570	100.0	213	100.0	115	100.0	898	100.0

Autopsy Data

Autopsies were performed on 82.0 percent of the 898 deaths. Autopsies were coded according to type, hospital or medicolegal, and

whether the autopsy was designated as complete or not by the Mortality Study Project Director (F.C.). There were 524 autopsies performed in the hospital, 499 or 95.2 percent of which were termed as complete. Medicolegal autopsies, that is, those done under the auspices of coroners, accounted for 23.5 percent of all autopsies; 95.3 percent of these were termed as complete by the Project Director (Table 33).

Table 33

Degree of Completeness of Autopsy By Place of Autopsy and By Age At Death

Type of Autopsy	Age At Death							
	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Hospital (complete)	410	71.9	50	23.5	39	33.9	499	55.6
Hospital (partial or incomplete)	14	2.5	4	1.9	2	1.7	20	2.2
Hospital (unspecified if complete)	3	0.5	2	0.9	0	-	5	0.6
All Hospital	427	74.9	56	26.3	41	35.7	524	58.4
Medicolegal (complete)	15	2.6	133	62.4	53	46.1	201	22.4
Medicolegal (incomplete)	1	0.2	5	2.3	4	3.5	10	1.1
All Medicolegal	16	2.8	138	64.7	57	49.6	211	23.5
Type Not Specified	0	-	1	0.5	0	-	1	0.1
No Autopsy	127	22.3	18	8.5	17	14.8	162	18.0
Total	570	100.0	213	100.0	115	100.0	898	100.0

Death Certificates

Death certificates received by the study were assessed by the Mortality Study Staff as to completeness and accuracy. This assessment was classified into inaccurate medical reporting or clerical error or both. Among the 898 death certificates received, 369, (41.1 percent) had

an inaccuracy of some kind. One or more medical inaccuracies were found on 21.0 percent of all death certificates (Table 34).

Table 34

Inaccuracies on Death Certificate By Age At Death

Lack of Accuracy	Age At Death							
	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Medical Inaccuracy	115	20.2	13	6.1	14	12.2	142	15.8
Clerical Error	131	23.0	37	17.4	12	10.4	180	20.1
Both Medical and Clerical	44	7.7	3	1.4	0	-	47	5.2
None Noted	280	49.1	160	75.1	89	77.5	529	58.9
Total	570	100.0	213	100.0	115	100.0	898	100.0

Preventability

The University of California Mortality Study group was interested in examining the circumstances surrounding the childhood deaths included in the study. Therefore, questions concerning the preventability of the death and responsibility for it were added to the questionnaire. Preventability of the death was determined by the weekly case conference group of the University of California School of Public Health: deaths were classified as preventable, possibly preventable, not preventable, and preventability not determinable. Among the 898 deaths, 36 (4.0 percent) were considered to be clearly preventable and 57 (6.4 percent) were considered possibly preventable (Table 35). There were 72 cases (8.0 percent) whose preventability could not be determined. Deaths considered as unpreventable, 733 (81.6 percent) comprised the greatest proportion of deaths. It is of interest that deaths during the preschool period had the highest percentage of preventability, 13.0 percent.

Table 35

Preventability of Deaths (Assigned by Study Committee) By Age At Death

Preventability	Age At Death							
	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Preventable	6	1.0	15	7.0	15	13.0	36	4.0
Possibly Preventable	41	7.2	8	3.8	8	7.0	57	6.4
Not Preventable	501	87.9	167	78.4	65	56.5	733	81.6
Preventability Not Determinable	22	3.9	23	10.8	27	23.5	72	8.0
Total	570	100.0	213	100.0	115	100.0	898	100.0

When a case was classified as preventable, a further judgment was made as to the responsibility for the hypothetical action which might have prevented the death. Of the 93 preventable or possibly preventable deaths, the committee judged that 52 (38 neonatal, 13 postneonatal, and 2 preschool) might have been prevented by a physician or hospital personnel. A total of 37 (10 neonatal, 9 postneonatal, and 18 preschool) might have been prevented by the family. The high number of preschool deaths that might have been prevented by the family reflects the importance of external causes of death in this age group. The study group did not assign responsibility in three cases (Table 36).

Table 36

Responsibility for Preventable Deaths (Assigned By Study Committee) By Age At Death

Responsibility	Age At Death							
	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Medical	37	78.7	13	56.5	2	8.7	52	55.9
Family	10	21.3	9	39.1	18	78.3	37	39.8
Community	0	-	0	-	1	4.3	1	1.1
Not Assigned	0	-	1	4.4	2	8.7	3	3.2
Total	47	100.0	23	100.0	23	100.0	93	100.0

Assignment of Cause of Death

The weekly case conferences, by which the underlying and associated causes of death were assigned, utilized data from all available sources. The bases on which cause of death were assigned were classified as follows:

a. Clinical history plus autopsy

b. Clinical history, no autopsy

c. Death certificate only

There were no cases in which an autopsy was the only available information.

The great majority of cases, 736 (82.0 percent) were decided on the basis of both clinical history and autopsy. Another 161 (17.9 percent) had the benefit of a well-defined clinical picture but no autopsy. Only one case depended upon the death certificate alone for assignment of cause of death (Table 37).

Table 37

Basis For Assignment of Cause of Death By Study Committee By Age At Death

Basis	Age At Death							
	Neonatal		Postneonatal		Preschool		Total	
	#	%	#	%	#	%	#	%
Clinical History and Autopsy Available	448	78.6	191	89.7	97	84.3	736	82.0
Clinical History Only	122	21.4	21	9.8	18	15.7	161	17.9
Death Certificate Only	0	-	1	0.5	0	-	1	0.1
Total	570	100.0	213	100.0	115	100.0	898	100.0

CAUSES OF DEATH

The underlying cause of death in each of the 898 cases was assigned by the weekly case conferencing committee as described in the Chapter on Methodology (Chapter II). The assignment and subsequent coding of the underlying cause of death were based on the selection procedures outlined in the International Classification of Diseases.[7] Assignment of the associated causes of death was based on rules and coding procedures developed by the Pan American Health Organization.[8] Classification and enumeration of underlying and associated causes of mortality are based on the format adopted by the Pan American Health Organization and enable comparison with data from each of the other 14 projects in the Inter-American Investigation of Mortality in Childhood.

Infancy

Among the 898 deaths studied by the University of California School of Public Health, Berkeley, Study Project on Childhood Mortality, there were 783 deaths during the first year of life, comprising a rate of 1750.3 deaths per 100,000 live births (Table 38). Over one-half of these deaths, 907.5 per 100,000 live births, were attributed to "Certain Causes of Perinatal Mortality," 760-778, in the International Classification of Diseases. This category includes conditions such as the following: Maternal conditions (categories 760-763), including those related to pregnancy, and those independent of gestation, such as

Difficult labors and/or consequential birth injury (categories 764-768 and 772)

Important complications of pregnancy (category 769), including conditions such as premature rupture of membranes, antepartum hemorrhage and multiple pregnancy.

Hemolytic disease of the newborn (categories 774-775).

Hypoxic and anoxic conditions of unspecified cause (category 776), including hyaline membrane disease, respiratory distress syndrome, and others.

Immaturity or prematurity, unqualified (category 777).

Other complications of the newborn (category 778).

Congenital anomalies accounted for the second largest group of deaths during infancy, 281.7 per 100,000 live births. Third in importance were pneumonia and influenza, given as the underlying cause of death in 134.1 cases per 100,000 live births. Sudden deaths in infancy were fourth, with a rate of 127.4 per 100,000 live births, and infective and parasitic diseases ranked fifth, 76.0 per 100,000 live births, as a cause of infant mortality within the San Francisco Bay Area Study.

Neonatal Period

Almost all deaths (900.8 out of 907.5 per 100,000 live births) attributed to "Certain Causes of Perinatal Mortality" occurred during the first 4 weeks of life, comprising the main cause of death during the neonatal period (Table 38). Congenital anomalies were the next leading cause, with a rate of 203.4 deaths per 100,000 live births. Diseases of the circulatory system were third, 51.4 deaths per 100,000 live births. Fourth and fifth ranked causes of death during the neonatal period were infective and parasitic diseases, 26.8 per 100,000 live births, and pneumonia and influenza, 24.6 per 100,000 live births, respectively. Diseases of the digestive system followed closely, with a mortality rate of 22.4 per 100,000 live births.

Postneonatal Period

During the postneonatal period, age 28 days to 1 year, there were 476.1 deaths per 100,000 live births (Table 38). Almost 25

percent (118.5) of these deaths were attributed to sudden deaths. Twenty-three percent (109.5) were attributed to pneumonia and influenza, and congenital anomalies were responsible for 78.2 deaths per 100,000 live births during the one-year study period. Infective and parasitic diseases ranked fourth along with external causes, each with a rate of 49.2 per 100,000 live births, as underlying causes of death in the post-neonatal period.

Preschool

Deaths of children age 1 to 4 years occurred at a rate of 70.9 per 100,000 population (Table 38). The leading cause of death was accidents, responsible for 41 percent of the deaths in this age group, with a rate of 29.0 per 100,000 population. Transportation accidents, fires, drownings, and homicides were the most common types of fatal accidents (Appendix 4). Rates for other causes were considerably lower: congenital anomalies ranked second with a rate of 10.5 per 100,000 population, followed by leukemia 5.5; malignant neoplasms, and inflammatory diseases of the central nervous system, each at a rate of 4.3 per 100,000 population. Pneumonia and influenza, and infective and parasitic diseases each had rates of 3.7 deaths per 100,000 population.

The leading causes of death for each major age group were thus:

Infancy	Rates per 100,000 live births
All causes	1750.0
Certain causes of perinatal mortality	907.5
Congenital anomalies	281.7
Pneumonia and influenza	134.1
Sudden Infant Death	127.4
Infective and parasitic diseases	76.0

Preschool Period	Rates per 100,000 population
All causes	70.9
External causes	29.0
Congenital anomalies	10.5
Leukemia	5.5
Malignant neoplasms	4.3
Inflammatory diseases of the central nervous system	4.3
Pneumonia and Influenza	3.7
Infective and Parasitic Diseases	3.7

Table 38

Causes of Death in Children Under 5 Years of Age With Rates Per 100,000 by Age Group

		Infant		Neonatal		Postneonatal		Preschool	
		Number	Rate	Number	Rate	Number	Rate	Number	Rate
All Causes		783	1750.3	570	1274.1	213	476.1	115	70.9
Infective and Parasitic Diseases	000-136	34	76.0	12	26.8	22	49.2	6	3.7
Leukemia	204-207	1	2.2	0	-	1	2.2	9	5.5
Other Malignant Neoplasms	140-203, 208-209	1	2.2	1	2.2	0	-	7	4.3
Benign and Unspecified Neoplasms	210-239	1	2.2	0	-	1	2.2	0	-
Nutritional Deficiency	260-269	0	-	0	-	0	-	0	-
Endocrine and Metabolic Diseases	240-258, 270-279	2	4.5	0	-	2	4.5	2	1.2
Deficiency Anemias	280-281	0	-	0	-	0	-	0	-
Other Diseases of Blood and Blood Forming Organs	282-289	1	2.2	1	2.2	0	-	0	-
Inflammatory Diseases of Central Nervous System	320-324	13	29.1	7	15.6	6	13.4	7	4.3
Other Diseases of Nervous System and Sense Organs	310-315, 330-389	7	15.6	0	-	7	15.6	3	1.8
Diseases of Circulatory System	390-458	26	58.1	23	51.4	3	6.7	3	1.8
Pneumonia and Influenza	470-486	60	134.1	11	24.6	49	109.5	6	3.7
Other Diseases of Respiratory System	460-466, 490-519	4	8.9	0	-	4	8.9	1	0.6
Diseases of Digestive System	520-577	14	31.3	10	22.4	4	8.9	3	1.8
Diseases of Genito-Urinary System	580-629	1	2.2	1	2.2	0	-	2	1.2
Diseases of Skin, Subcutaneous Tissue	680-709	0	-	0	-	0	-	0	-
Diseases of Musculoskeletal System	710-738	0	-	0	-	0	-	0	-
Congenital Anomalies	740-759	126	281.7	91	203.4	35	78.2	17	10.5
Certain Causes of Perinatal Mortality	760-778	406	907.5	403	900.8	3	6.7	1	0.6
Symptoms	780-789	0	-	0	-	0	-	0	-
Sudden Death	795	57	127.4	4	8.9	53	118.5	0	-
Other Ill-Defined Conditions	790-792, 796	3	6.7	2	4.5	1	2.2	1	0.6
External Causes	E800-E999	26	58.1	4	8.9	22	49.2	47	29.0

CAUSES OF INFANT AND CHILDHOOD MORTALITY

The information contained in the original case records (birth and death certificates, hospital records, and autopsy reports), and on the assignment of cause of death by the University of California Study Staff was reviewed and reclassified to fit into the Butler classification used in the British Perinatal Mortality Study,[9] and to fit into a more standard clinical-pathologic format used in common practice in the U.S.A. The following section contains the data resulting from this reclassification.

CAUSES OF NEONATAL MORTALITY

Of the total 569 neonatal deaths in the study, 363 (63.7 percent) were attributed to anoxia; 102 (17.9 percent) to congenital malformations; 43 (7.5 percent) to infections; 39 (6.8 percent) to birth injury; 5 (0.9 percent) to iso-immunization; 4 each (0.7 percent) to sudden infant death syndrome and to spontaneous perforation of the stomach; 3 (0.5 percent) to aspiration pneumonia; and 2 (0.4 percent) to hemorrhagic diathesis, cause undetermined (Table 39).

Anoxia

There were 363 deaths associated with anoxia. The largest group was associated with respiratory distress syndrome (30.0 percent), either alone or in combination with other conditions. Of the conditions associated with respiratory distress syndrome as a cause of death, cerebral hemorrhage or infection played a major role (Table 40).

In addition to the respiratory distress syndrome deaths, 111 deaths were attributed to asphyxia (19.5 percent), and 55 to atelectasis (9.6 percent) (Table 39).

Congenital Malformations

Of the total 102 deaths attributed to a congenital malformation, 38 were due to congenital heart disease, and 21 to central nervous system malformations (largely anencephaly). Ten deaths were due to malformations of the gastrointestinal system (largely diaphragmatic hernia associated with malrotation of the GI tract), and 9 deaths were due to genito-urinary anomalies (largely renal agenesis or polycystic kidneys). A total of 13 deaths were associated with multiple anomalies (Table 41).

Infections

Of the total 43 deaths attributed to an infection, the major types were pneumonia, septicemia and meningitis (Table 42).

Birth Injury

All deaths attributed to birth injury were due to intracranial or subarachnoid hemorrhage (Table 43).

Comparison With British Perinatal Mortality Study[9]

Because of the fact that the British Perinatal Mortality Study is the only recent large-scale community study of perinatal deaths, it is relevant that a comparison of causes of death be made.

The percentage of deaths attributed to congenital malformations in the two studies was similar (17.9 percent and 17.5 percent) (Table 44).

The U.S.A. study found more deaths attributed to anoxia (66.4 percent) compared with 36.5 percent in the British study, and more deaths attributed to infection and birth injury.

The British study found more deaths attributed to iso-immunization.

Table 39

Summary of Causes of Neonatal Deaths

Cause			Number	Percent
Anoxia			363	63.7
Antepartum	1	0.2%		
Intrapartum	25	4.4%		
Postnatal				
Asphyxia	111	19.5%		
Respiratory Distress Syndrome	171	30.0%		
Alone 94				
With other conditions 77				
Atelectasis	55	9.6%		
Congenital malformations			102	17.9
Infection			43	7.5
Birth injury			39	6.8
Iso-immunization			5	0.9
Sudden Infant Death Syndrome			4	0.7
Spontaneous perforation of stomach			4	0.7
Aspiration pneumonia			3	0.5
Hemorrhagic diathesis of newborn			2	0.4
Accidents and other external causes			1	0.2
Unknown			4	0.7
Total			570	100.0

Table 40

Neonatal Deaths Associated With Respiratory Distress Syndrome

Cause		Number
Respiratory Distress Syndrome alone		94
Respiratory Distress Syndrome with		77
cerebral hemorrhage	44	
congenital malformations	7	
infection	11	
aspiration pneumonia	3	
cerebral hemorrhage plus infection	7	
congenital malformation plus infection	1	
birth injury	1	
pulmonary hemorrhage	1	
cerebral hemorrhage plus pulmonary hemorrhage	1	
cerebral hemorrhage plus ABO incompatability	1	
Total		171

Table 41

Neonatal Deaths Attributed To Congenital Malformations

Type of Congenital Malformation		Number
Congenital heart disease		38
alone	27	
with other congenital malformation	7	
with other conditions	4	
Central nervous system		21
anencephaly	16	
encephalocele, meningocele, hydrocephalus	5	
Gastrointestinal system		10
Genito-urinary system		9
Down's Syndrome		4
Trisomy 18		3
Musculo-skeletal system		2
Respiratory system		2
Multiple systems		13
Total		102

Table 42

Neonatal Deaths Attributed To Infection

Type of Infection		Number
Pneumonia		14
Septicemia		15
alone	4	
with meningitis	8	
with other conditions	3	
Meningitis		8
Miscellaneous		6
Total		43

Table 43

Neonatal Deaths Attributed To Birth Injury

Type		Number
Intracranial hemorrhage		36
alone	17	
with pneumonia	3	
with atelectasis	3	
with tentorial tear	8	
with pulmonary hemorrhage	2	
with miscellaneous	3	
Subarachnoid hemorrhage		3
Total		39

Table 44

Comparison of Causes of Neonatal Death in U.S.A. Study With Study in United Kingdom

Cause	U.S.A.	United Kingdom*
Anoxia		
Antepartum	0.2%	10.3%
Intrapartum	4.4%	21.4%
Postnatal		
Asphyxia	19.5%	
Respiratory Distress Syndrome	30.0%	4.8%
Atelectasis	9.6%	
Congenital malformation	17.9%	17.5%
Infection	7.5%	4.5%
Birth injury	6.8%	3.0%
Iso-immunization	0.9%	3.9%
Sudden Infant Death Syndrome	0.7%	
Spontaneous perforation of stomach	0.7%	
Aspiration pneumonia	0.5%	
Hemorrhagic diathesis of newborn	0.2%	
Unknown	0.7%	
Antepartum, no major lesion		10.3%
Intrapartum anoxia plus cerebral birth trauma		6.3%
Massive pulmonary hemorrhage		1.8%
Intraventricular hemorrhage		2.1%
Early neonatal, no histological lesion		3.0%
Remainder		3.9%
No autopsy		7.2%

* Source: Butler, N.R., and Bonham, D.G. Perinatal Mortality. E & S Livingstone Ltd. London. 1963.

CAUSES OF POSTNEONATAL DEATHS

The major causes were infections; Sudden Infant Death Syndrome; congenital malformations: and accidents (Table 45).

Infections

Of the 69 deaths in this group, 46 were due to respiratory causes; 8 were due to infections of the central nervous system; 5 were due to gastroenteritis (Table 46).

Sudden Infant Death Syndrome

There was a total of 62 deaths attributed to Sudden Infant Death Syndrome. Twenty were found to have evidence of pneumonia; 3 at autopsy were reported to have epidural hemorrhage of the spinal cord; and 1 had cleft palate. The other 38 were reported to have no other finding (Table 47).

Congenital Malformations

Within this group, deaths due to congenital heart disease, malformation of the central nervous system, and Down's Syndrome were the most frequent types. Some deaths due to a congenital malformation were associated with infection (Table 48).

Accidents and Other External Causes

Within this group, burns, falls, aspiration pneumonia, and accidental strangulation play a prominent role. Included also are child abuse and homicide (Table 49).

Anoxia

There were 5 deaths due to anoxia; 4 of these were respiratory distress syndrome, 3 of which were complicated by infection. The fifth was an infant with neurofibromatosis, and post-tracheotomy obstruction of the airway.

Table 45

Causes of Postneonatal Deaths

Overall Summary

Cause by Group	Deaths	
	Number	Percent
Infections	69	32.4
Sudden Infant Death Syndrome	62	29.1
Congenital Malformations	49	23.0
Accidents	22	10.3
Anoxia	5	2.4
Malignant Disease	1	0.5
Unknown	5	2.3
Total	213	100.0

Table 46

Postneonatal Deaths Due To Infections

Type			Number
Respiratory			46
Pneumonia		44	
Pneumonia	40		
Pneumonia, septicemia, otitis media	1		
Pneumonia, gastroenteritis	1		
Pneumonia, pertussis	1		
Pneumonia, aspiration of vomitus	1		
Tracheobronchitis		2	
Meningitis or Encephalitis			8
Meningitis		6	
Virus encephalitis		2	
Septicemia			7
Sepsis, meningitis		1	
Meningococcemia		5	
Sepsis		1	
Gastroenteritis			5
Miscellaneous			3
Cytomegalic inclusion disease		1	
Generalized viral infection		1	
Congenital rubella, CHD,* aspiration pneumonia		1	
Total			69

*Congenital heart disease.

Table 47

Postneonatal Deaths Attributed To Sudden Infant Death Syndrome

Cause	Number
Sudden Infant Death Syndrome	38
Sudden Infant Death Syndrome, pneumonia	20
Sudden Infant Death Syndrome, epidural hemorrhage of spinal cord	3
Sudden Infant Death Syndrome, cleft palate	1
Total	62

Table 48

Postneonatal Deaths Due To Congenital Malformation

Type		Number
Congenital Heart Disease		22
Congenital heart disease	13	
C.H.D., cataracts	1	
C.H.D., septicemia	1	
C.H.D., bronchiolitis	1	
C.H.D., septicemia, pneumonia	1	
C.H.D., multiple anomalies of brain	1	
C.H.D., pneumonia	3	
Endocardial fibroelastosis	1	
Down's Syndrome		7
Down's, pneumonia	2	
Down's, congenital heart disease	1	
Down's, aspiration pneumonia	1	
Down's, cleft palate, blindness	1	
Down's, pneumonia, septicemia, meningitis	2	
Central Nervous System		7
Hydrocephalus, sepsis, peritonitis	1	
Meningomyelocele, hydrocephalus, agenesis of kidney	1	
Hydrocephalus, septicemia, meningitis	1	
Werdnig-Hoffman Syndrome	2	
Hydrocephalus	1	
Hydrocephalus, meningomyelocele	1	
Gastrointestinal		5
Congenital malformation of small intestine, surgery, peritonitis	1	
Hirschsprungs, peritonitis, septicemia, pneumonia	1	
Volvulus, strangulated	1	
Intussusception, aspiration pneumonia	1	
Intestinal obstruction, pneumonia	1	
Genito-urinary		2
Renal hypoplasia, ureteral strictures	1	
Congenital urethral valves, hydronephrosis	1	
Miscellaneous		6
Trisomy 18, congenital heart disease	1	
E Trisomy, pneumonia	1	
Galactosemia	1	
Congenital agammaglobulinemia, sepsis	1	
Multiple congenital malformations	1	
Achondroplasia, pneumonia	1	
Total		49

Table 49

Postneonatal Deaths Due To Accidents and Other External Causes

Type		Number
Accidents		
Auto accidents		1
Drowning		1
Burns		3
Burns (homicide)	1	
Burns, carbon monoxide poisoning	2	
Falls		3
Fall	2	
Fall, aspiration pneumonia	1	
Drug overdose		1
Child abuse		1
Homicide		1
Aspiration pneumonia		4
Accidental strangulation		3
Miscellaneous		4
Trauma, ? accidental, ? abuse	2	
Cardiac arrest in surgery for cavernous hemangioma	1	
Post surgical death	1	
Total		22

CAUSES OF DEATH IN CHILDREN AGE 1 TO 4 YEARS

As would be expected in a technologically developed country, the major causes of death were accidents and other external causes: congenital malformations: infections; and malignant disease (Table 50).

Accidents and Other External Causes

Within this group, deaths due to auto accidents, drowning, carbon monoxide, or burns play a prominent role. Also in this age group, falls, homicide, child abuse, aspiration pneumonia, aspiration of foreign body, or drug reactions appear (Table 51).

Congenital Malformations

Within this group, deaths due to congenital heart disease or malformations of the central nervous system (meningomyelocele or hydrocephalus) play a prominent role. In addition, 3 deaths occurred in children with Down's Syndrome. Some (6) of the deaths due to congenital malformation were associated with infection (Table 52).

Infection

Within this group, pneumonia, meningitis, or septicemia play a prominent role. The organism identified in the meningitis or sepsis cases was pneumococcus, H. influenzae, or meningococcus (Table 53).

Malignant Disease

Within this group, leukemia plays a prominent role (Table 54).

Birth Injury

This group of 3 deaths consist of 2 children with cerebral palsy with infection (1 pyelonephritis, the other pneumonia); and 1 child with intraventricular hemorrhage, hydrocephalus, and meningitis.

Endocrine and Metabolic Disease

This group of 2 deaths consists of 1 child with nephrosis, the other with Gaucher's disease.

Sudden Infant Death Syndrome

There were 2 deaths, 1 in a child with Down's Syndrome.

Table 50

Causes of Death in Children Age 1 to 4 Years

Overall Summary

Cause by Group	Deaths	
	Number	Percent
Accidents and other external causes	49	42.6
Congenital malformations	23	20.0
Infections	19	16.5
Malignant disease	16	14.0
Birth injury	3	2.6
Endocrine and metabolic disease	2	1.7
Sudden Infant Death Syndrome	2	1.7
Unknown	1	0.9
Total	115	100.0

Table 51

Deaths in Children Age 1 to 4 Years
Due to Accidents and Other External Causes

Type		Number
Accidents		
Auto accidents		12
Drowning		10
Carbon monoxide poisoning		6
Burns		4
Burns	3	
Burns, carbon monoxide poisoning	1	
Falls		2
Aspiration of foreign body		2
Struck by falling object		2
Drug reaction		2
Child abuse		2
Homicide		2
Aspiration pneumonia		2
Post-fall hydrocephalus	1	
Epilepsy	1	
Stricture of oesophagus - due to lye		1
Cardiac arrest during bronchoscopy		1
Hanging		1
Total		49

Table 52

Deaths in Children Age 1 to 4 Years Due to Congenital Malformation

Type		Number
Congenital Heart Disease		10
C.H.D. alone	8	
C.H.D., cleft palate and lip, skeletal anomalies	1	
Subendocardial fibroelastosis	1	
Central Nervous System		8
Meningomyelocele	2	
Hydrocephalus	1	
Meningomyelocele, meningitis	1	
Meningomyelocele, ventriculitis	1	
Hydrocephalus, bronchopneumonia	2	
Microcephaly, aspiration pneumonia	1	
Down's Syndrome		3
With pneumonia	1	
With aspiration of vomitus	1	
With fibrocystic disease, pneumonia	1	
Miscellaneous		2
Biliary atresia	1	
Strangulation of small intestine	1	
Total		23

Table 53

Deaths in Children Age 1 to 4 Years Due to Infection

Type		Number
Respiratory		9
Pneumonia		
Pneumonia	4	
Pneumonia, mental retardation	1	
Post rubeola pneumonia	1	
Pneumonia, overwhelming sepsis	1	
Pneumonia, post meningitis hydrocephalus	1	
Tracheobronchitis	1	
Meningitis		4
Meningitis	4	
Septicemia		4
Septicemia, meningitis, sickle cell anemia	1	
Meningococcemia	1	
Meningococcemia with meningitis	1	
Septicemia, sickle cell anemia	1	
Miscellaneous		2
Viral hepatitis	1	
Pyelonephritis, peritonitis, perirenal abscess, pneumonia	1	
Total		19

Table 54

Deaths in Children Age 1 to 4 Years
Due to Malignant Disease

Type		Number
Leukemia		9
Leukemia	8	
Leukemia, mongolism	1	
Wilms Tumor		3
Miscellaneous*		4
Total		16

* Consists of one each of medulloblastoma, astrocytoma, retinoblastoma, malignant teratoma

SUDDEN INFANT DEATH

Sudden deaths in infancy are of increasing concern to the health professional and public in the United States today. In January 1972, Senate hearings called attention to the magnitude and scope of the problem at a National level. The University of California School of Public Health, Berkeley, Mortality Study, recorded a mortality rate of 127.4 per 100,000 live births due to the Sudden Infant Death Syndrome. Among the 898 deaths occurring in the study area during a one-year period, 57 or 6.4 percent were attributed to Sudden Infant Death Syndrome. However, the numbers within different subgroups were too small to validly assess the relationship of Sudden Infant Death Syndrome to race, sex, maternal parity, and season (See Appendices 19, 20, 21, 22).

SUMMARY

There were 898 deaths of children under 5 years of age from June 1, 1969, to May 31, 1970, within a general population of 2,755,793 persons, 204,578 of whom (7.4 percent) were children under the age of 5. This study sample represented 94.9 percent of the total population of 2,903,481 within four counties (Alameda, Contra Costa, San Francisco, and San Mateo) of the San Francisco-Oakland Bay Area.

Among the 898 deaths, 570 (63.5 percent) were neonates, under 28 days of age, 213 (23.7 percent) were postneonates, 28 days to 12 months, and 115 (12.8 percent) were preschoolers, age 1 through 4 years.

Rates

The mortality rates of the study group by race and age group are summarized below:

Infant		17.5 per 1,000 live births
	White	15.7 per 1,000 live births
	Black	28.8 per 1,000 live births
	Other	11.2 per 1,000 live births
	Neonatal	12.7 per 1,000 live births
	White	11.6 per 1,000 live births
	Black	20.5 per 1,000 live births
	Other	7.6 per 1,000 live births
	Postneonatal	4.8 per 1,000 live births
	White	4.1 per 1,000 live births
	Black	8.2 per 1,000 live births
	Other	3.5 per 1,000 live births
Preschool		0.7 per 1,000 population
	White	0.6 per 1,000 population
	Black	1.1 per 1,000 population
	Other	0.5 per 1,000 population

The Black mortality rates were significantly higher than the [illegible] mortality rates among all three age groups.

Description of Study Population

Mean maternal age among Black mothers of deceased children (23.2 years) was significantly lower than that among White mothers of deceased children (25.2 years). A similar racial difference was found among fathers of deceased children.

Birth History

Among mothers of deceased children, 5.6 percent had no prenatal care; 10.9 percent had been delivered by cesarean section.

Among the 898 children, 12.5 percent were noted on the birth certificate or the hospital neonatal record to have had at least one congenital anomaly noted at birth. Congenital anomalies of the brain and central nervous system accounted for 22.1 percent, those of the cardiovascular system for 15.4 percent, and those affecting multiple systems accounted for 16.1 percent.

Low Birth Weight

Infants weighing 2500 grams or less at birth accounted for 56.5 percent of the 898 deceased children. Those weighing 1000 grams or less at birth accounted for 20.8 percent of the deceased children; those weighing between 1001 and 1500 grams for 14.4 percent, and those weighing between 1501 and 2500 grams for 21.3 percent.

A significantly greater proportion of Blacks (63.1 percent) than of the Whites (54.0 percent) were of low birth weight (2500 grams or less) and a significantly greater proportion of the Black low birth weight infants than of White low birth weight infants weighed 1500 grams or less at birth.

Mothers 40 years of age and over had the greatest proportion of low birth weight infants (69.6 percent). Mothers under 20 years of

age, second in frequency of low birth weight infants (2500 grams or less) had the greatest proportion of infants weighing 1500 grams or less at birth.

As expected, mothers with abnormal conditions related to pregnancy had a significantly greater proportion of infants weighing 2500 grams or less at birth than mothers without such conditions.

Circumstances of Death

Autopsies were performed on 736 (82.0 percent) of the 898 deaths and the autopsy data were considered in assigning cause of death in all of these.

Causes of Death

Mortality rates for the main causes of death within each age group are summarized below, in accord with the International Classification of Diseases, 1965.

Infant	Rates per 100,000 live births
All causes	1750.3
Certain causes of perinatal mortality	907.5
Congenital anomalies	281.7
Pneumonia and influenza	134.1
Neonatal	
All causes	1274.1
Certain causes of perinatal mortality	900.8
Congenital anomalies	203.4
Postneonatal	
All causes	476.1
Sudden infant death	118.5
Pneumonia and influenza	109.5
Preschool	**Rates per 100,000 population**
All causes	70.9
External causes	29.0
Congenital anomalies	10.5

A retabulation of the causes of death using the Butler classification enabled a comparison of this study with the British Perinatal Mortality Study.

The main causes of death in the neonatal period were:

Anoxia	63.7%
Congenital malformation	7.5%
Infections	6.8%

Major causes during the postneonatal period were:

Infections	32.4%
Sudden Infant Death Syndrome	29.1%
Congenital malformations	23.0%

During the preschool period the major causes of death were:

Accidents and other external	42.6%
Congenital malformations	20.0%
Infections	16.5%

CHAPTER IV: PROBABILITY SAMPLE OF LIVE CHILDREN

DESCRIPTION OF STUDY SAMPLE

The Probability Sample of Live Children consisted of a sample of 10,315 persons, which included 699 children under 5 years of age, taken within the study area during an eighteen month period (June 1, 1969 through November 30, 1970). The greatest number of persons in the sample (4,074) were from Alameda County representing 0.403 percent of that county's study area population, the fewest were from San Mateo County (1,370) representing 0.276 percent of the study area population in that county. Contra Costa County contributed 2,258 people and San Francisco 2,613 people, representing 0.424 percent and 0.365 percent respectively of the study area population within each of those two counties. The study sample was thus composed of 10,315 persons, 39.5 percent of them from Alameda County, 21.9 percent from Contra Costa County, 13.3 percent from San Mateo County, and 25.3 percent from San Francisco County (Table 55).

Racial Composition

Alameda County had both the greatest number and largest proportion of Blacks within its sample, 750 persons, comprising 18.4 percent of its sample. San Mateo County had both the least number of Blacks (81) and the smallest proportion (5.9 percent) (Table 56). Other races, which in the San Francisco-Oakland Bay Area, are predominantly Orientals, comprised 11.8 percent of the sample in San Francisco County but only 2.2 percent in Contra Costa County. San Mateo County, where 2.9 percent of the sample population was of other races, contributed

the fewest number (39) to the total study sample. The total Probability Sample of Live Children was thus composed of 10,315 people, 8,385 (81.3 percent) of them White, 1,406 (13.6 percent) Black, and 524 (5.1 percent) of Other races.

Age

There were 699 children under 5 years of age, 6.8 percent of the total sample (Table 57). San Francisco and San Mateo Counties each had small proportions of children under 5 years of age, 5.0 and 5.1 percent, respectively, whereas, Alameda and Contra Costa Counties each had high proportions of this age group, 7.8 and 7.9 percent, respectively. Children under 1 year of age represented 1.4 percent of the total Probability Sample, drawn from a low of 0.5 percent in San Mateo County to a high of 1.7 percent in Alameda County. Children age 1 to 4 years of age represented 5.4 percent of the sample population. Alameda and Contra Costa Counties each had higher proportions of this age group, 6.1 and 6.5 percent, respectively, and San Mateo and San Francisco Counties lower, 4.6 and 3.8 percent, respectively. A finer breakdown of the sample population by age is contained in Appendix 23.

Income

Each interviewer asked the member of each household being interviewed for the total family income for the past twelve months. Income was recorded to the next lowest thousand dollars. Median total family income ranged from a low of $9,000 per year in Alameda County to a high of $11,800 per year in San Mateo County, with a median family income of $10,000 for the total sample population (Table 58).

Household Size

The number of rooms and the number of persons in each household sample were noted, and the percentage of households with more than 1.00 person per room computed for each county sample. The percentage of households with 1.01 or greater persons per room was 4.5 percent for the total study sample, ranging from 2.7 percent in San Mateo County to 5.6 percent in Alameda County (Table 59).

Table 55

Number and Percent of Persons in Probability Sample of Live Children by County

County	Total Population in Study Area	Number in Sample	Percent of Study Area Population in Sample	Percent of Total Study Sample in County
Alameda	1,010,639	4,074	0.403	39.5
Contra Costa	532,446	2,258	0.424	21.9
San Mateo	497,034	1,370	0.276	13.3
San Francisco	715,674	2,613	0.365	25.3
Total	2,755,793	10,315	0.374	100.0

Table 56

Number and Percent of Persons in Probability Sample of Live Children by Race and County

County	Race							
	White		Black		Other		Total	
	#	%	#	%	#	%	#	%
Alameda	3,197	78.5	750	18.4	127	3.1	4,074	100.0
Contra Costa	2,042	90.4	167	7.4	49	2.2	2,258	100.0
San Mateo	1,250	91.2	81	5.9	39	2.9	1,370	100.0
San Francisco	1,896	72.6	408	15.6	307	11.8	2,613	100.0
Total	8,385	81.3	1,406	13.6	524	5.1	10,315	100.0

Table 57

Number and Percent of Persons in Probability Sample of Live Children by Age and County

County	Age																	
	under 1 year		1 to 4 years		Total 0 to 4 years		5 to 19 years		20 to 44 years		45 to 64 years		65 years and over		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Alameda	71	1.7	248	6.1	319	7.8	1,091	26.8	1,288	31.6	902	22.1	450	11.1	24	0.6	4,074	100.0
Contra Costa	32	1.4	146	6.5	178	7.9	677	30.0	707	31.3	532	23.6	138	6.1	26	1.1	2,258	100.0
San Mateo	7	0.5	63	4.6	70	5.1	381	27.8	441	32.2	357	26.1	110	8.0	11	0.8	1,370	100.0
San Francisco	32	1.2	100	3.8	132	5.0	498	19.1	938	35.9	675	25.8	337	12.9	33	1.3	2,613	100.0
Total	142	1.4	557	5.4	699	6.8	2,647	25.7	3,374	32.7	2,466	23.9	1,035	10.0	94	0.9	10,315	100.0

Table 58

Distribution of Annual Family Incoem in Probability Sample of Live Children by County

County	Income														Median Income
	$5,999 and under		$6,000 to $9,999		$10,000 to $14,999		$15,000 to $24,999		$25,000 and over		Unknown		Total		
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	
Alameda	60	25.4	52	22.0	57	24.2	27	11.4	3	1.3	37	15.7	236	100.0	$ 9,000
Contra Costa	12	9.0	29	21.8	39	29.3	22	16.5	3	2.3	28	21.1	133	100.0	$11,500
San Mateo	2	3.8	12	23.1	15	28.9	9	17.3	1	1.9	13	25.0	52	100.0	$11,800
San Francisco	18	17.1	28	26.7	26	24.8	7	6.7	2	1.9	24	22.8	105	100.0	$ 9,200
Total	92	17.5	121	23.0	137	26.1	65	12.3	9	1.7	102	19.4	526	100.0	$10,000

Table 59

Percent of Households With 1.01 or More Persons Per Room
In Probability Sample of Live Children by County

County	Persons Per Room	
	1.00 or less	1.01 or more
Alameda	94.4	5.6
Contra Costa	95.7	4.3
San Mateo	97.3	2.7
San Francisco	96.8	4.2
Total	95.5	4.5

MOTHERS OF CHILDREN UNDER 5 YEARS OF AGE

In each household with a child under 5 years of age, specific information was elicited regarding the health, education, and reproductive history of the mothers of each of these children. There were 526 mothers (5.1 percent of the 10,315 people in the study sample) having 699 children of this age.

Age

Mothers age 15 to 19 years comprised 6.3 percent of the 515 mothers of known age of children under 5 years of age sample by the study, whereas mothers age 35 years and over comprised 15.8 percent of the sample (Table 60).

Education

Only 5.8 percent of the mothers with children under 5 years of age had an elementary school education or less. Another 10.7 percent had 4 or more years of college, ranging from 9.2 percent in Contra Costa County to 15.2 percent in San Francisco County. The median level of education was 11.6 years of schooling completed (Table 61).

Prenatal Care

Among the 520 natural mothers of children under 5 years of age in the study sample, 414 (79.6 percent) received prenatal care during the first trimester. Only 4 mothers (0.8 percent) began care during the eighth or ninth month of pregnancy.

The relationship of maternal education to the start of prenatal care was examined. Mothers receiving care during the first trimester were classed as one group, and those receiving it later as a

second group. Maternal education was also classified into two groups: those having less than a high school education, and those having at least 4 years of high school. A statistically significant difference was found between the two groups; mothers who have not completed their high school education come later for care than do mothers who have completed 4 years of high school (Table 62).

Use of Contraception

Mothers of children under 5 years of age interviewed by the study were asked whether they were using any form of contraception. Mothers currently pregnant and those mothers or fathers having been sterilized were omitted from consideration. There were 264 of the 444 mothers at risk (59.5 percent) who said that they were using some form of contraception.

The use of contraception declined with increasing age: among mothers age 15 to 19 years, 74.2 percent, were using contraception, whereas among those 35 years and over, only 36.4 percent were using some contraceptive method (Table 63).

The use of contraception was significantly greater among mothers who had at least a high school education than among those who had completed 3 years of high school or less.

Table 60

Ages of Mothers of Children Under 5 Years of Age
In Probability Sample of Live Children

Age	Number	Percent
15 to 19 years	33	6.3
20 to 24 years	139	26.4
25 to 29 years	173	32.9
30 to 34 years	91	17.3
35 years and over	83	15.8
unknown	7	1.3
Total	526	100.0

Table 61

Completed Years of Education of Mothers of Children Under 5 Years of Age
In Probability Sample of Live Children by County

County	Education												Median
	Elementary				High School				College						
	1 to 4 years		5 to 8 years		1 to 3 years		4 years		1 to 3 years		4 years or more		Total		
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	
Alameda	5	2.1	11	4.7	46	19.7	101	43.2	48	20.5	23	9.8	234	100.0	11.6
Contra Costa	0	-	3	2.3	30	22.9	51	38.9	35	26.7	12	9.2	131	100.0	11.6
San Mateo	0	-	3	5.8	4	7.7	25	48.1	15	28.8	5	9.6	52	100.0	11.8
San Francisco	4	4.0	4	4.0	10	10.1	42	42.4	24	24.3	15	15.2	99	100.0	11.8
Total	9	1.7	21	4.1	90	17.4	219	42.4	122	23.7	55	10.7	516*	100.0	11.6

* 10 women with unknown amount of education were omitted from this table

Table 62

Time At Which Mothers of Children Under 5 Years of Age
Began Prenatal Care By Education of Mother

Education	Trimester Care: 1st Trimester #	1st Trimester %	2nd Trimester or later #	2nd Trimester or later %	Total #	Total %
3 Years High School or Less	83	20.2	31	36.5	114	23.0
4 Years High School or More	328	79.8	54	63.5	382	77.0
Total	411	100.0	85	100.0	496	100.0

Table 63

Use of Contraception Among Mothers At Risk of Conception*
In Probability Sample of Live Children By Age and Education

Maternal Age	Total Number	Contraceptive Users	
		Number	Percent
15 to 19 Years	31	23	74.2
20 to 24 Years	121	84	69.4
25 to 29 Years	151	93	61.6
30 to 34 Years	75	40	53.3
35 Years & Over	66	24	36.4
Total	444	264	59.5

Education	Total Number	Contraceptive Users	
		Number	Percent
Elementary	23	5	21.7
High School			
1 to 3 Years	74	43	58.1
4 Years	189	122	64.6
College			
1 to 3 Years	112	67	59.8
4 Years or More	44	27	61.4
Total	442	264	59.7

*Mothers currently pregnant, sterilized or whose partners had been sterilized were omitted from the table.

CHILDREN UNDER 5 YEARS OF AGE

Among the 10,315 people sampled in the Probability Sample of Live Children, 699 (6.8 percent) were under 5 years of age. The 142 children less than 1 year of age comprised 1.4 percent of the total probability sample and the 577, age 1 to 4 years, 5.4 percent of the sample. The male:female was 1.02 with 50.5 percent male and 49.5 percent female (Table 64). Racially, 517 (74.0 percent) were White, 145 (20.7 percent) Black, and 37 (5.3 percent) of "Other races" (Table 65).

Breast Feeding

Among the 699 children under 5 years of age in the study sample, 468 (67.0 percent) were not breast fed at all. One hundred (14.3 percent) were breast fed for 1 to 3 months, 54 (7.7 percent) for 4 to 7 months, and 43 (6.1 percent) for 8 months or more (Table 66). It is apparent that since some of the infants were still being breast fed at the time of the interview, the data are understated with respect to duration of breast feeding. Although the frequency with which children were breast fed seems to increase with increasing maternal age, the difference is not statistically significant. Mothers with at least a high school education did not have a higher proportion of breast fed babies than those having less than 4 years of high school (Table 67).

Mothers who stated that they did not breast feed their children within the study sample were asked why they had not chosen to do so. Most (71.8 percent) gave the health of the child as the main reason for not breast feeding. The meaning of this response is unknown: that is, we do not know whether the child's health at birth necessitated bottle

feeding, or whether the mother believed that the child's well-being would best be served by bottle rather than breast feeding. Only 4.5 percent of the mothers in the study sample said that they did not breast feed due to a lack of desire or interest on their part (Table 68 and Appendix 24). It is interesting to note that mothers under 30 years of age gave the health of the child as the reason for not breast feeding in a significantly greater proportion of cases than did mothers 30 years of age and over. Maternal education was not significantly related to the reasons given for not breast feeding.

Table 64

Number and Percent of Children Under 5 Years of Age
In Probability Sample of Live Children By Race, Sex and County

County	White		Black		Other		Total			
	male	female	male	female	male	female	male		female	
							#	%	#	%
Alameda	113	101	46	50	8	1	167	52.4	152	47.6
Contra Costa	77	77	6	13	4	1	87	48.9	91	51.1
San Mateo	37	32	0	1	0	0	37	52.9	33	47.1
San Francisco	40	40	14	15	8	15	62	47.0	70	53.0
Total	267	250	66	79	20	17	353	50.5	346	49.5

Table 65

Racial Composition of Children Under 5 Years of Age
In Probability Sample of Live Children by County of Residence

County	White		Black		Other		Total	
	#	%	#	%	#	%	#	%
Alameda	214	67.1	96	30.1	9	2.8	319	100.0
Contra Costa	154	86.5	19	10.7	5	2.8	178	100.0
San Mateo	69	98.6	1	1.4	0	0.0	70	100.0
San Francisco	80	60.6	29	22.0	23	17.4	132	100.0
Total	517	74.0	145	20.7	37	5.3	699	100.0

Table 66

Number and Percent of Children Under 5 Years of Age Breast Fed
In Probability Sample of Live Children by Age of Mother

Age of Mother	Duration Breast Fed											
	not breast fed		1 to 3 months		4 to 7 months		8 months or more		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
15 to 19 years	27	73.0	7	18.9	0	-	2	5.4	1	2.7	37	100.0
20 to 24 years	137	69.9	35	17.9	8	4.1	14	7.1	2	1.0	196	100.0
25 to 29 years	160	66.7	27	11.2	22	9.2	12	5.0	19	7.9	240	100.0
30 to 34 years	76	63.9	15	12.6	14	11.8	10	8.4	4	3.3	119	100.0
35 years and over	62	63.3	16	16.3	9	9.2	5	5.1	6	6.1	98	100.0
Unknown	6	66.7	0	-	1	11.1	0	-	2	22.2	9	100.0
Total	468	67.0	100	14.3	54	7.7	43	6.1	34	4.9	699	100.0

Table 67

Breast Feeding During Infancy
In Probability Sample of Live Children by Education of Mother

Education of Mother	Duration Breast Fed: not breast fed		1 to 3 months		4 to 7 months		8 months or more		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Elementary	20	47.6	6	14.3	1	2.4	9	21.4	6	14.3	42	100.0
High School												
1 to 3 years	90	73.2	15	12.2	9	7.3	6	4.9	3	2.4	123	100.0
4 years	235	80.5	31	10.6	10	3.4	11	3.8	5	1.7	292	100.0
College												
1 to 3 years	88	56.0	33	21.0	15	9.6	11	7.0	10	6.4	157	100.0
4 years or more	26	35.6	15	20.6	19	26.0	5	6.8	8	11.0	73	100.0
Unknown	9	75.0	0	-	0	-	1	8.3	2	16.7	12	100.0
Total	468	67.0	100	14.3	54	7.7	43	6.1	34	4.9	699	100.0

Table 68

Reasons for Not Breast Feeding
In Probability Sample of Live Children by Age of Mother

Age of Mother	Health of Child	Other Reasons*	Unknown	Total
Less Than 30 Years	247	60	17	324
30 Years and Over	87	35	16	138
Unknown	2	0	4	6
Total	336	95	37	468

* Includes health of mother, insufficient milk and no desire to breast feed

HEALTH CARE OF CHILD

Common Childhood Diseases

Table 69 describes the ages at which the children in the study sample had the common communicable diseases of childhood. Diseases included were rubella, measles, mumps, chickenpox, and pertussis. It should be remembered that the study period (July 1, 1969 through November 30, 1970) began just prior to the large scale rubella immunization programs.

Immunizations

Table 70 describes the number of children known to have had any of the following immunizations: D.P.T., polio, smallpox, rubella, measles, mumps, other vaccines (typhoid, influenza, etc.). It should be noted that the study period began just prior to the national immunization programs for rubella vaccine. In the study sample, only 2.2 percent of the children under 5 years of age had been immunized against rubella, whereas 97.2 percent had received any polio vaccine.

The schedule for active immunization of normal infants and children recommended by the Committee on Infectious Diseases of the American Academy of Pediatrics[10] is as follows:

2 months	DPT	TOPV
4 months	DPT	TOPV
6 months	DPT	TOPV
1 year	measles	--
1 to 12 years	rubella	mumps
1 year 6 months	DPT	TOPV
4 to 6 years	DPT	TOPV

Medical Attention

Mothers interviewed in the Probability Sample of Live Children were asked whether each of their children under 5 years of age had been attended by a physician or in a clinic or hospital during the past year. Among the 588 children about whom such information was known, 80.2 percent had received medical attention of some kind during the past year (Table 71). There were no significant differences by county in the numbers of children having received medical attention during the past year.

Care of Child

The person who cared for each of the children under 5 years of age for most of the day was recorded and the relationship of the type of caretaker to maternal age and education explored. Fewer mothers with at least a high school education cared for their own children than those with less than 4 years of high school (Table 72). However, there was no relationship between age of mother and the type of caretaker. It is interesting to note the small number of children in day care.

Table 69

Ages At Which Children Under 5 Years of Age Had Common Childhood Diseases
In Probability Sample of Live Children

Disease	Age													
	never had disease		less than 1 year		1 to 3 years		3 to 4 years		had disease age unknown		unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Rubella	636	91.0	15	2.1	28	4.0	5	0.7	4	0.6	11	1.6	699	100.0
Measles	641	91.7	17	2.4	25	3.6	0	-	3	0.4	13	1.9	699	100.0
Mumps	652	93.2	2	0.3	21	3.0	9	1.3	4	0.6	11	1.6	699	100.0
Chickenpox	596	85.3	10	1.4	51	7.3	24	3.4	7	1.0	11	1.6	699	100.0
Pertussis	676	96.7	6	0.9	4	0.6	1	0.1	1	0.1	11	1.6	699	100.0

Table 70

Number and Percent of Children Under 5 Years of Age
In Probability Sample of Live Children Having Had Any Immunizations

Type of Immunization	Type With Immunization Data	Number Immunized	Percent Immunized
D.P.T.	643	625	97.2
Polio	639	583	91.2
Measles	645	463	71.8
Smallpox	640	356	55.6
Mumps	619	187	30.2
Rubella	540	12	2.2
Other Vaccines	646	10	1.5

Table 71

Medical Care to Children in Probability Sample of Live Children By County

County	Children Having Had Medical Attention During Past Year	
	#	%
Alameda	257	81.0
Contra Costa	146	82.5
San Mateo	55	78.6
San Francisco	100	75.8
Total	558	80.2

Table 72

Care of Children in Probability Sample of Live Children by Education of Mother

Maternal Education	Care of Child: mother		grand-mother		other relative		maid		day care		other		unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Elementary	35	83.3	4	9.5	2	4.8	0	-	0	-	0	-	1	2.4	42	100.0
High School																
1 to 3 years	105	85.4	10	8.1	3	2.5	2	1.6	1	0.8	2	1.6	0	-	123	100.0
4 years	217	74.3	23	7.9	14	4.8	22	7.5	7	2.4	6	2.1	3	1.0	292	100.0
College																
1 to 3 years	110	70.1	13	8.3	9	5.7	10	6.4	7	4.4	6	3.8	2	1.3	157	100.0
4 years or more	60	82.2	0	-	0	-	5	6.9	3	4.1	3	4.1	2	2.7	73	100.0
Unknown	7	58.4	1	8.3	2	16.7	0	-	0	-	1	8.3	1	8.3	12	100.0
Total	534	76.4	51	7.3	30	4.3	39	5.5	18	2.6	18	2.6	9	1.3	699	100.0

SUMMARY

The Probability Sample of Live Children was drawn from a general population of 2,755, 793 within the study area during an eighteen-month study period (June 1, 1969 through November 30, 1970). Among the 10,315 members of the 4,000 households interviewed, there were 699 children under 5 years of age who fell into the study sample. Children under 1 year of age comprised 1.4 percent of the population sampled; those 1 to 4 years of age, 5.4 percent, for a combined total of 6.8 percent of the 10,315 people in the sample.

Household Data

Median family income for the sample was $10,000 and the percentage of households with 1.01 or more persons per room was 4.5 percent.

Mothers of Children Under 5 Years of Age

Among the 10,315 people in the sample, 526 (5.1 percent) were mothers of children under 5 years of age. Of the 526 mothers, those age 15 to 19 years comprised 6.3 percent and those 35 years and over 15.8 percent.

Median level of education was 11.6 years of school completed, only 5.8 percent having had an elementary school education or less.

Among the 520 natural mothers of children under 5 years of age, 414 (79.6 percent) began prenatal care during the first trimester. Maternal education was significantly related to the time at which prenatal care was begun: mothers with 4 or more years of high school came earlier for care than did those without a high school diploma.

The use of contraception declined with increasing age and was significantly related to maternal education, i.e. high school graduates more frequently used some method of contraception.

Children Under 5 Years of Age

Among the 699 children in the sample, 50.5 percent were male and 49.5 percent female. There were 517 (74.0 percent) Whites, 145 (20.7 percent) Blacks, and 37 (5.3 percent) of "Other races."

Only 33 percent of the 699 children were known to have been breast fed at all; younger mothers significantly more often gave the health of the child as the reason for not breast feeding than did older mothers.

At the time the sample was taken, 97.2 percent of the children under 5 years of age had had any D.P.T. immunizations and 91.2 percent any polio immunization.

Among the 588 children about whom such information was accurately known, 80.2 percent had had some form of medical attention during the past year.

Significantly fewer mothers who had completed high school cared for their own children throughout the day than did mothers with less schooling.

CHAPTER V: LIMITATIONS OF STUDY

The limitations of the University of California School of Public Health, Berkeley, Investigation of Mortality in Childhood may be divided into three major categories: 1) Limitations imposed by the design of the international collaborative study, within which the University of California, Berkeley Study was a participating project; 2) Limitations imposed by the quality and variability of data; and 3) Limitations imposed by budgetary considerations.

The design of the Inter-American Investigation of Mortality in Childhood was composed of two main components: 1) The Mortality Component, which consisted of an accumulation of data on all deaths to children under 5 years of age within the study area during a specified period; 2) The Probability Sample of Live Children, which contained information on a sample of live children under 5 years of age gathered through home interviews.

The Mortality Component

In the Mortality Component, although questionnaires designed for the large scale collaborative study were modified to suit local needs and interests, the major emphasis of much of the data collected was directed toward problems more prevalent in Latin America. For example, case discussion and analysis were often limited by the paucity of obstetrical information regarding the deceased child or his mother. To compensate for this lack of data, the University of California study staff introduced a two page supplement regarding labor and delivery into the Mortality Questionnaire (Appendix 2). This information was

utilized by the University of California study staff in arriving at the most comprehensive cause of death for each child.

The quality of data available for analysis by the Mortality Component of the Study was variable due to the lack of uniformity of source material. There were several places at which the study staff encountered variations in quality and content. Death certificates completed by physicians and clerks and processed by state and county health departments gave evidence of qualitative variation. It should be noted that as far as is known, no deaths of children under 5 years of age within the study area went unrecorded by the county and/or state offices of vital statistics. Birth certificates matched to death certificates showed fewer variations. In very few cases (approximately six) was the study staff unable to locate and match the birth and death certificates of deceased children. The quality of data abstracted from hospital records varied from place to place. However, review and subsequent follow-up by the medical staff of the study eliminated some of this variation in quality. Clinical material was supplemented by postmortem examination in 82.0 percent of the 898 deaths studied. While 700 of the 736 autopsies performed (95.1 percent) were designated as complete by the study staff, 10 of the 211 medico-legal autopsies were classified as incomplete. This lack of complete information was particularly distressing when such autopsies were performed on children dying suddenly in infancy. Another limitation of the study was some lack of homogeneity between groups reviewing cases during the weekly case conferences. Although the first Project Director (F.C.) was at every meeting and two of the Maternal and Child Health Faculty members attended most, but not all, meetings, other physicians attending these case conferences varied from week to week.

Budgetary restrictions were responsible for three meaningful limitations of the Mortality Component of the study. The cost of home interviews to the families of each of the deceased children was prohibitive; this was also true for inclusion of the entire San Francisco-Oakland Standard Metropolitan Statistical Area within the boundaries of the study. Further, abstraction of hospital and medical records by professional medical personnel would possibly have enhanced the quality of data.

The Probability Sample of Live Children

The Probability Sample of Live Children consists of data gathered in home interviews by professionally trained personnel of the University of California, Berkeley, Survey Research Center, under contract to the School of Public Health Mortality Study. As noted in the discussion of the Mortality Questionnaire, local needs and interests were somewhat limited by the requirements of participation in collaborative study. Questions regarding health care services and use of contraception were added, but the thrust of the data collected is toward the interests of the Latin American countries.

The availability of population data for the study was dependent upon the United States Census Bureau and was limited. Racial groups considered by the Census Bureau are White, Black, and Other, whereas the Mortality Study had allowed for the more detailed classification of White, Black, White with Spanish surname, Orientals, and Other Since denominators were not available from the U.S. Census Bureau for each of these subgroups, the study staff was unable to calculate rates by any finer breakdown. The greatest limitation imposed by the use of census data was the unavailability of 1970 individual census tract

material for use in the analysis of study findings. Population data for the study area, as well as the numbers of live births, were of necessity estimates based on the 1970 census figures for each of the four counties. That is, individual census tract figures were not available to compute the exact numbers of persons, by race, sex, age, and so on, contained within each of the four counties within the study area. Instead, total figures for each county were multiplied by the proportion of each county that each study area represented to derive denominators for the study area.

CHAPTER VI: SUMMARY AND RECOMMENDATIONS

Summary

The University of California School of Public Health, Berkeley, Investigation of Mortality in Childhood collected data on all deaths within a study area comprising 2,755,793 people, during a one-year period from June 1, 1969 through May 31, 1970. In addition, a population of live children was sampled within the same study area during an eighteen-month period, June 1, 1969 through November 30, 1970, to examine characteristics of the population from which the deceased children were drawn.

There were 898 deaths of children under 5 years of age within the study area during the one-year study period. Infants comprised 87.2 percent (neonates 63.5 percent and postneonates 23.7 percent) and preschoolers, age 1 to 4 years, 12.8 percent of the deaths. The infant mortality rate was 17.5 deaths per 1,000 live births: with a neonatal rate of 12.7 per 1,000 live births and a postneonatal rate of 4.8 per 1,000 live births. The preschool mortality rate was 0.7 per 1,000 population, aged 1 to 4 years in the study area. Blacks had significantly higher mortality rates within each age group. There were, in addition, variations in rates by county.

"Certain Causes of Perinatal Mortality", categories 760-778 in the International Classification of Disease were the predominant cause of death during infancy, with a rate of 907.5 (51.8 percent) of the 1750.3 deaths per 100,000 live births. "Causes of Perinatal Mortality" were responsible for 70.7 percent of the deaths during the neonatal period (under 28 days), whereas the Sudden Death Syndrome in

Infancy was the major cause of death during the postneonatal period (28 days to 11 months), claiming 24.9 percent of the deaths during this period. Accidents were the leading cause of death during the preschool years (1 to 4), with a rate of 29.0 deaths per 100,000 population, comprising 41.4 percent of the 70.9 deaths per 100,000 population occurring in that age group. Congenital anomalies were the second largest cause of death in infancy and the preschool years, responsible for 16.1 percent and 14.8 percent of the deaths, respectively, within each age group.

A reclassification of the causes of death using the system devised by Butler in his study of Perinatal Mortality,[9] organized the results in a clinicopathologic framework. Anoxia was the leading cause of death during the neonatal period, infections during the postneonatal period, and accidents during the preschool years.

The Probability Sample of Live Children consisted of a sample of 10,315 people drawn from 4,000 households sampled in the study area during the 18-month study period. There were 699 children in the sample, 142 of them under 1 year of age and 557 of them 1 to 4 years of age, representing 1.4 and 5.4 percent respectively of the total sample. The racial composition was 74.0 percent White, 20.7 percent Black, and 5.3 percent of "Other Races."

Significant findings included positive correlations between maternal education and the initiation of prenatal care and the use of contraception. Reasons given for not breast feeding were also significantly related to maternal education.

Childhood immunizations for D.P.T. and polio were administered in 97.2 percent and 91.2 percent, respectively, of the children under

5 years of age. Among the 558 children for whom such information was available, 80.2 percent were known to have had some type of medical attention during the year prior to when the sample was taken.

Recommendations

Recommendations based on the conclusions reached by the study may be divided into two categories: those based upon the design and conduct of the study and those based upon the actual results of the study.

Recommendations based upon the conduct of the study may be further subdivided into those relating to the study design and those concerning the quality of data retrieved by the study.

Recommendations Regarding Study Design

1. The incorporation of obstetrical consultants in the planning and conduct of the study would enhance the quality of data, particularly in regard to the obstetrical antecedents of neonatal causes of death, and would expand the teaching and research capabilities of the study.

2. Continuous monitoring and evaluation of each project at local and central levels would assure greater uniformity between collaborating groups.

   a. Provision of personnel at a central level would increase uniformity.

   b. On-site visits by project personnel to other collaborating projects would encourage an interchange of information at an operational level.

Recommendations Regarding Quality of Data

1. Consideration should be given to the development of a different type of certificate for recording and reporting information in regard to live births and the deaths of infants and young children. Potential changes might include the use of a combined live birth-death certificate, requiring only one certificate, instead of two, in the case of a live birth and early neonatal death.

2. Physicians should be made aware of the meaning and usefulness of accurately completed birth and death certificates and the official circumstances regarding completion and filing of the certificate should favor, not hinder, accuracy. Medical students and resident staff should be educated to the uses of data from birth and death certificates and the potentials for improvement of vital statistics.

3. Hospitals and physicians should be encouraged to adopt more uniform formats for records. The development of new forms could be initiated at national or international level by governmental agencies with the participation of university personnel.

4. Because of the variation in the quality of postmortem examination, including those done under medicolegal supervision, the adoption of recommended national guidelines for the conduct of postmortem examinations would encourage uniformity and accuracy of autopsy data.

5. Antecedent maternal health information should be included on all of the above documents, that is, birth and perinatal death certificates, medical and hospital records, and autopsy records.

Recommendations Based on Analysis of Data

1. The mortality component of the project pointed up the

need for continued study of infant and early childhood mortality, including socioeconomic aspects. The mortality rates for Blacks were significantly higher than those for Whites at each age group within each county studied.

a. The differences in mortality rates should be investigated to determine the influence of health care delivery systems and other factors on these rate differentials.

2. Each age group studied is characterized by one or two causes of death which far exceed all others in that group. Continued research support and medical and public attention must be given to the etiology, diagnosis, and prevention of each of these diseases.

a. Causes of Perinatal Morbidity and Mortality (including neonatal anoxia and low birth weight) during the neonatal period.

1) It is recommended that more operational research be undertaken to evaluate the manifold methods of care of the low birth weight or other high risk newborn.

b. Sudden Infant Death Syndrome during the postneonatal period.

1) It is recommended that public health and medical personnel should study in depth the causes and prevention of Sudden Infant Death.

2) It is recommended that the public be continually advised of new developments in the field and the burden of guilt of parents of children dying of

Sudden Infant Death Syndrome be alleviated through programs of public education.

c. Accidents during the preschool period.

1) Continued research should be directed into the nature and causes of early childhood accidents in defining high risk families and children and specific environmental circumstances.

2) Public education should be intensified and include programs for parents and for children at nursery, elementary, and high school levels in the prevention and treatment for accidents and accident victims.

a) The public should be advised of characteristic patterns of major accidents under particular conditions: for example, the time of day, age of child and his supervision, and the activity of parents or guardians concerned.

3. The relationship of maternal education to health related behavior, often described,[11,12] was exemplified by findings in the Probability Sample of Live Children.

a. Education in the need for health maintanence should begin at the nursery or elementary school level, not delayed until high school or college level, when some of those at risk have already dropped out of school or begun their own families.

4. A survey should be undertaken to assess the effectiveness of the national and local programs to immunize all children. Through participation in the Inter-American Investigation of Mortality in

Childhood, the staff of the University of California School of Public Health, Berkeley, project has formulated two major recommendations to add to those above:

1. State and local health departments should assume responsibility for the stimulation, planning, and conduct of community-wide research on perinatal, infant, and childhood mortality on an individual case basis.

2. The Pan American Health Organization and the Maternal and Child Health Service of the U.S. government should give consideration to planning other collaborative studies which would be of value to other countries concerned and to which the collaborative framework would lend strength. It would be particularly advantageous to initiate and conduct such research with project personnel from the collaborative study.

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APPENDICES

1. Map of San Francisco - Oakland Standard Metropolitan Statistical Area showing Study Area
2. Mortality Component Questionnaire
3. Variables Coded From Mortality Questionnaire
4. Childhood Accident Mortality in the San Francisco Bay Area
5. Probability Sample Questionnaire
6. Variables Coded From Probability Sample Questionnaire
7. - 23. Tables

Appendix I.

Map of San Francisco S.M.S.A.

Study Area -------

& county lines ------

One inch = 8 miles

130

iwg-71.

APPENDIX 2

INTER-AMERICAN INVESTIGATION
OF MORTALITY IN CHILDHOOD

CALIFORNIA STUDY - PH 205

FACE SHEET
MORTALITY SERIES

Req.	PROCEDURE	DATE COMPLETED
	Hospital Record	
	Autopsy	
	Medical Doctor	
	Home Visit	

U. C. Serial No. _____

Type of Case: Hospital ☐ Coroner ☐ Home ☐

Autopsy: Yes ☐ No ☐

Hospitals:

	Name	Unit Number
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____

Physicians:

	Name	Address	Phone
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

Other Sources: _____

_____

_____

_____

Name _____

4-1-69 (85)

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Confidential

California Study

1. Name of child

2. Serial no.

3. Date of birth	4. Date of death	5. Sex	6. Age at death yrs. mos. days hrs.

7. Address

Sector or division

HOUSING

8. Neighborhood	9. Type of housing	10. Number of rooms	11. Water: Piped water Inside ☐ Outside ☐ Other ☐	12. Toilet: Flush ☐ Other ☐ None ☐

13. HOUSEHOLD ROSTER

Ind no.	Name	Relation to head	Date of birth*	Age	Sex	Marital status	Education: Total years	Education: Last Type	Education: Last Years	Length of residence: In community	Length of residence: Last 5 years Urban	Length of residence: Last 5 years Rural
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

*Enter date of birth for children under 6 years.

14. OCCUPATION

Ind. no.	Name	Currently employed	Occupation	Kind of business	Time in occupation

15. DEATHS IN HOUSEHOLD IN PAST YEAR

Name of deceased	Age	Sex	Date	Home	Hosp.	Name of hospital	Other

16. PREGNANCY HISTORY OF MOTHER

Order	Date pregnancy ended	Abortion?	Stillbirth?	Live births: Name of child	Sex	Living now?	Age at death
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

17. Pregnant now? Yes ☐ No ☐ Unknown ☐ 18. Remarks: _____

19. Source of information: Name _____ Ind. no. _____ Date _____ Interviewer _____

By Observation: 1. W 2. N 3. WS 4. Or 5. Other _____

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Name of child

Serial no.

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs.

20. DATA ON PARENTS

Ind. no.	Name	Live here?	Date of birth	Age	Marital status	Education	Employed now?	Occupation	Business
	Father								
	Mother								

21. Was the mother of this child seen by physician, or in a clinic or hospital during pregnancy? Yes ☐ No ☐ Unknown ☐
If yes, name of physician, clinic or hospital _____ Dates _____
Reason _____
Months pregnant at first visit? _____ Number of visits _____

22. Length of pregnancy _____ months Unknown ☐

23. Were there complications during pregnancy? No ☐ Yes ☐ If yes, check below. Unknown ☐
Edema ☐ Convulsions ☐ Threatened abortion ☐ Hemorrhage ☐
Trauma ☐ Operation ☐ Specify _____
Infectious disease ☐ Specify _____

24. Where born? Home ☐ Hospital ☐ Name and address _____ Other ☐

25. Who attended birth? Doctor ☐ Midwife ☐ Other ☐ _____ Certificate no. _____

26. Was the delivery spontaneous? No ☐ Yes ☐ Unknown ☐ Were instruments used? No ☐ Yes ☐ Unknown ☐
Was anesthesia given? No ☐ Yes ☐ Was sedation given? No ☐ Yes ☐ Cesarian? No ☐ Yes ☐

27. Was the general aspect of child good at birth? No ☐ Yes ☐
If not good, what did you notice? _____

28. Birth weight _____ Unknown ☐

29. Did you breast feed the child? Yes ☐ When did you start weaning? Age _____ months Reason _____
When did you finish weaning? Age _____ months _____
No ☐ Why not? _____ Unknown ☐

30. Was other milk used? No ☐ Yes ☐ At what age? _____ months or _____ days Times per day _____
Composition: Milk _____ Water _____ Was use of milk continued? _____

31. Was other weaning food used? _____ Was weaning food continued? _____

32. Give age in months when foods were added:	JUICES: ___ mos. Times per week ___	CEREALS: ___ mos. Times per week ___	PULSES: ___ mos. Times per week ___	ROOTS, TUBERS: ___ mos. Times per week ___
LEAFY VEGETABLES: ___ mos. Times per week ___	EGGS: ___ mos. Times per week ___	POULTRY: ___ mos. Times per week ___	MEAT: ___ mos. Times per week ___	FISH: ___ mos. Times per week ___

33. At what age (in months) did child do the following: a) raise head? ___ b) seat self? ___ c) stand alone? ___
d) walk alone? ___ e) control bladder? ___ f) control bowels? ___ g) feed self? ___

34. Who cared for child most of day: Mother ☐ Grandmother ☐ Sibling (15 yrs.+) ☐ Sibling(-15 yrs.) ☐
Other relative ☐ Maid ☐ Day care ☐ Other ☐

35. Has your child been vaccinated? Yes ☐ No ☐ Unknown ☐ If yes, which vaccinations _____

36. At what age in months did child have following: a) German measles? ___ b) measles? ___ c) chickenpox? ___
d) whooping cough? ___ e) mumps? ___

37. Remarks: _____

38. Source of information: Mother ☐ Father ☐ Other ☐ _____

Date _____ Interviewer _____

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Name of child _____ Serial no. _____

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs.

39. During the past year, has this child been attended by a physician or in a clinic or hospital? Yes ☐ No ☐ Unknown ☐

Name of physician, clinic or hospital	Type*	Dates	Days in hospital	Reason	Number of visits

*Indicate whether clinic (health center or hospital) C, in-patient in hospital H, practicing physician P, emergency E.

40. Did the child receive medical attention before the past year? Yes ☐ No ☐ Unknown ☐

Name of physician, clinic or hospital	Type*	Dates	Days in hospital	Reason	Number of visits

*Indicate whether clinic (health center or hospital) C, in-patient in hospital H, practicing physician P, emergency E.

41. Disease a) How long was the child ill? _____ b) How did illness start? _____

c) What disease do you think caused the child's death? _____

42. Description of the disease by the mother _____

43. Home treatment _____

44. Prescriptions _____

45. Who prescribed? _____

46. Did the mother see signs of malnutrition? (edema, loss of weight, changes in hair or skin) _____

47. To doctor a) Was child taken to doctor? No ☐ Yes ☐ b) How many days after onset of illness? _____

c) What was condition of child? Slightly ill ☐ Moderately ill ☐ Very ill ☐

48. Where did child die? Home ☐ Hospital ☐ Name _____ Other ☐

49. Death certificate number _____

50. Source of information: Mother ☐ Father ☐ Other ☐

Date _____ Interviewer _____

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Name of child | Serial no.

Date of birth	Date of death	Sex	Age at death yrs. mos days hrs.

DATA OBTAINED FROM HOSPITAL, CLINIC OR PHYSICIAN

51. Abnormal conditions of pregnancy	None ☐	Edema ☐	Hypertension ☐	Albuminuria ☐	Convulsions ☐	Hyperemesis ☐	Anemia ☐	Threatened abortion ☐	Placenta previa ☐	Other, specify
52. Conditions unrelated to pregnancy	None ☐	German measles ☐	T b c pulm. ☐	Syphilis ☐	Operation: reason, findings			Trauma, specify		Other, specify

53. Delivery	Spontaneous ☐	Manipulation ☐	Forceps ☐	Cesarian ☐	Anesthesia ☐	Sedation ☐	Other, specify	54. Length of gestation	55. Single or multiple birth

DATA ON CHILD (age in completed months in first line)

56. Age	At birth										
57. Weight											
58. Nutritional status											

59. DATA ON NEWBORN FROM RECORD

General state: Good ☐ Fair ☐ Poor ☐
Activity: Normal ☐ Abnormal ☐
First cry ____ min. First breathing ___ min.
Movements: Normal ☐ Abnormal ☐
Muscular tone: Increased ☐ Normal ☐ Decreased ☐
Head - Size: Increased ☐ Normal ☐ Decreased ☐
Shape: Normal ☐ Abnormal ☐
Cephalohematoma ☐ Lacerations ☐
Eyes, nose, ears, mouth ____
Neck - Rigidity: Yes ☐ No ☐ Masses ☐
Chest: ____
First voiding ____ hrs. First bowel movement ____ hrs.
First feeding ____ hrs. Type ____
Acceptance ☐ Rejection ☐

Genitals: Normal ☐ Abnormal ☐
Extremities: Normal ☐ Abnormal ☐
Skin, color ____
Cyanosis: General ☐ Extremities ☐
Jaundice: Yes ☐ No ☐ Time ____
Hemorrhagic signs: Yes ☐ No ☐
Infection signs: ____
Lacerations: Yes ☐ No ☐
Edema ____
Breathing: Normal ☐ Irregular ☐
Secretion ____
Abdominal: Masses ☐ Hernia ☐
Congenital anomalies: ____

Progress: ____

60. PRINCIPAL FINDINGS IN HOSPITAL AND CLINICS, PRIOR TO ILLNESS LEADING TO DEATH

61. Source of information:	Hospital ☐	Clinic ☐	Private M. D. ☐	Other ☐

Date ____ Interviewer ____

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ADDITIONAL DETAILS OF LABOR AND DELIVERY

Column	Question	Code
1-4	Serial No.	
5	Weight Gain In Pregnancy 1. too little (less than 15 lbs.) 2. normal (15-25 lbs.) 3. excessive (more than 25 lbs.) 9. not recorded E.D.C. _____ L.M.P. _____ Other Antepartum Complications: _____	
6	Blood Serology 1. negative 2. positive 9. not recorded	
7	Rh 1. negative 2. positive 9. not recorded Antibodies: _____	
	Intrapartum Course	
8	Membranes Ruptured 24 Hours Or More Before Delivery 1. no 2. yes 9. not recorded Details: _____	
9	Quantity Of Amniotic Fluid 1. normal 2. oligohydramnios 3. polyhydramnios 9. not recorded	
10	Color Of Amniotic Fluid 1. clear 2. meconium stained 3. meconium 4. bloody 5. other 9. not recorded	
11	Fever (over 99°F or 37.2°C) 1. no 2. yes 9. not recorded Details: degree _____ duration _____ treatment: _____	

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Column	Question	Code
2-13	First Stage Of Labor-Duration	____ hrs.
14-15	Analgesia-details: _____	____ mins.
	_____	
16-17	Second Stage Of Labor-Duration	____ hrs.
18-19	Analgesia-details: _____	____ mins.
	_____	
20	Fetal Distress During Labor 1. no 2. yes 9. not recorded	
	Details: _____	
	_____	
	Delivery	
21	Presentation 1. vertex 2. breech 3. other 9. not recorded	
	Complications: _____	
	_____	
	_____	
	Reasons for cesarean: _____	
	_____	
22	Blood Loss At Delivery _____ cc.	
	1. normal (average) - up to 250 cc. 2. moderately excessive - 251 to 500 cc. 3. excessive (hemorrhage) - over 500 cc.	
	Details: _____	
	_____	
23	Placenta/Cord 1. normal 2. abnormal 9. not recorded	
	Details: _____	
	_____	
	_____	
	_____	
79-80	Deck Identification	1 5

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Confidential

California Study

Name of child _____ Serial no. _____

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs.

PRESENT ILLNESS - EVENTS THAT LED TO DEATH OF THE CHILD

62. Date disease started _____ 63. How disease started _____

64. Main symptoms _____

65. Description of disease _____

PHYSICAL EXAMINATION (at admission to hospital or first outpatient or house visit)

66. Date _____ 67. Height _____ 68. Weight and arm circumference: Wt. _____ Arm circumference _____

69. Nutritional status _____

70. Relevant physical findings _____

71. Evolution and treatment _____

72. Source of information:	Hospital ☐	Clinic ☐	Private M. D. ☐	Other ☐

Date _____ Interviewer _____

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INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD
California Study

Confidential

Name of child _____ Serial no. _____

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs.

DATA OBTAINED FROM HOSPITAL, OUTPATIENT SERVICE OR PHYSICIAN

73. Relevant laboratory findings _____

74. X-rays: Site _____ Date _____ Results _____

75. Other auxiliary examinations _____

76. Surgical procedures and findings _____

77. Cytology _____ 78. Biopsy _____

79. CLINICAL DIAGNOSES _____

80. Autopsy? No ☐ Yes ☐ Date _____

81. Date hospitalized	82. Date discharged	83. Where died?	Home ☐	Outpatient service ☐	Hospital less than 48 hours ☐	Hospital 48 hours or more ☐	Other ☐

84. Source of information	Hospital ☐	Clinic ☐	Private M. D. ☐	Other ☐	Date	Interviewer

DATA OBTAINED BY HOME VISIT OF MEDICAL INTERVIEWER

85. Date disease started _____ 86. How disease started _____

87. Main symptoms _____

88. Description of disease _____

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Confidential

California Study

Name of child _____ Serial no. _____

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs

DATA OBTAINED BY MEDICAL INTERVIEWER IN HOME

89 Disease

a) How long was the child ill? _____ b) How did illness start? _____

c) What do you think caused death? _____ d) Did someone else have same disease?

90 Fever

a) Did the child have fever? No ☐ Little ☐ Moderate ☐ Very high ☐ b) How long? ___

c) Did you take the temperature? No ☐ Yes ☐ d) What was it? _____

91 Respiration

a) How was the respiration? Slow ☐ Normal ☐ Rapid ☐ Difficult ☐

b) Did the sides of nose move in breathing? Yes ☐ No ☐ c) Noise? _____

92 Cough

a) Did the child cough? No ☐ Little ☐ Moderate ☐ Heavy ☐

b) Expectoration? No ☐ Little ☐ Moderate ☐ Heavy ☐

c) Color of expectoration? White ☐ Yellow ☐ Green ☐ With blood ☐

93 Vomiting

a) Did the child vomit? No ☐ Little ☐ Moderate ☐ Severe ☐

b) What did he vomit? Solid ☐ Liquid ☐ Everything ☐

c) How long did he vomit? _____ days d) Did he lose appetite? _____

94 Feces

a) How were the feces? Very hard ☐ Hard ☐ Normal ☐ Loose ☐ Liquid ☐

b) Color of the feces? Yellow ☐ Brown ☐ Green ☐ Red ☐ Black ☐

c) How many times per day? _____ d) How many days? ___ e) Were worms seen? _____

95 Urine

a) Difficulty in urination? No ☐ Yes ☐ b) Retention of urine? No ☐ Yes ☐

c) Did urine diminish? No ☐ Yes ☐ d) Eliminated calculi? No ☐ Yes ☐

e) Color of urine? Dark ☐ Red ☐ Dirty ☐

96 Weight

a) Did the child lose weight? No ☐ A little ☐ Moderate ☐ Severe ☐

b) Did the arms get thinner? No ☐ Yes ☐ c) Legs? No ☐ Yes ☐ d) Face? No ☐ Yes ☐

e) Could ribs be seen under skin? No ☐ Yes ☐

97 Edema

a) Did the child have swollen legs? No ☐ Yes ☐ b) Swollen abdomen? No ☐ Yes ☐

c) Face? No ☐ Yes ☐

98 Skin

a) Did you see anything on skin? No ☐ Yes ☐

b) Appearance? Yellow ☐ Rash ☐ Pustule ☐ Cyanotic ☐ Pale ☐

Blemishes ☐ Depigmentation ☐ Dryness ☐

99 Hair

a) Did the child have much hair? No ☐ Yes ☐ b) Pull out easily? No ☐ Yes ☐

c) Change of color? No ☐ Yes ☐ d) Glossy? No ☐ Yes ☐

100 Neuromuscular activity

a) Did the child move actively? No ☐ Yes ☐ b) All parts of body? No ☐ Yes ☐

c) Delay in movement No ☐ Yes ☐ d) Since when _____

e) Convulsions? No ☐ Yes ☐

101 Pain

a) Did the child have pain? No ☐ Yes ☐ b) How long? _____

c) Continuous? No ☐ Yes ☐ d) Associated with what? _____

102 Accident

a) Did the child have a fall? No ☐ Yes ☐ b) Injury? _____

c) Other accident? No ☐ Yes ☐ d) Explain _____

103 Other

What other symptoms?

104 Observation

Provide data regarding these items before final illness.

105 To doctor

a) Did you take child to doctor? No ☐ Yes ☐ b) How soon after onset of illness? ___

c) What was condition of child? Slightly ill ☐ Moderately ill ☐ Very ill ☐

106 Source of information Mother ☐ Father ☐ Other _____ Date _____ Interviewer _____

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Name of child _____ Serial no. _____

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs.

AUTOPSY REPORT

107. Autopsy number _____ 108. Interval from death to initiation of autopsy _____

109. Weight _____ 110. Arm circumference _____

111. Other anthropometric measurements _____

112. Description of cadaver (note all positive findings, especially on nutrition) _____

113. Macroscopic examination of cavities and segments (positive findings of head, thorax, abdomen, pelvis, neck, limbs) _____

114. Macroscopic examination of organs (positive findings of appearance, surface, weight, color, consistency, etc.) _____

115. Microscopic examination of organs and tissues (positive findings of organs macroscopically abnormal and of those requested) _____

116. Positive laboratory findings from autopsy _____

117. Final diagnoses from autopsy: Direct cause of death: _____

Principal diagnosis (underlying cause): _____

Secondary diagnoses (associated causes): _____

118. Associated diagnoses not related with underlying cause: _____

119. Type of autopsy	Hospital	Verification of death	Medico-legal	Complete	Partial	Incomplete
	☐	☐	☐	☐	☐	☐

Date _____ Interviewer _____

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California Study

Name of child _____ Serial no. _____

Date of birth	Date of death	Sex	Age at death yrs. mos. days hrs

120. Medical certification of cause of death (exact copy)

			Duration	Classification
I	a			
	b			
	c			
II				

121. SUMMARY OF INVESTIGATION

Medical interviewer _____

		Basis for diagnosis	Classification
Underlying cause			
Associated causes	1.		
	2.		
	3.		
Evaluation of nutrition			

Principal collaborator _____

122. ASSIGNMENT BY REFEREE

		Basis	Special code for nutritional status
Underlying cause			
Associated causes	1.		
	2.		
	3.		

Basis for diagnosis:
1. Autopsy
2. Hospital
3. Clinical, definite
4. Clinical, questionable
5. Interview only
6. Death certificate only

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Appendix 3

Variables Coded From Childhood Mortality Questionnaire

1. Date of birth
2. Date of death
3. Sex
4. Age at death
5. Census tract
6. Maternal gravidity
7. Maternal parity
8. Race
9. Mother's age (in years)
10. Mother's marital status
11. Father's age (in years)
12. Father's marital status
13. Father's occupation
    - 0 unemployed
    - 1 professional, technical, managers
    - 2 clerical
    - 3 skilled
    - 4 semi-skilled
    - 5 service
    - 6 unskilled
    - 7 military service
    - 8 student
    - 9 unknown
14. Mother's 1st M.D. visit during pregnancy (by trimester)
15. Hospital of birth
16. Who attended birth
    - 0 no one
    - 1 M.D.
    - 2 midwife
    - 3 other
    - 9 unknown
17. Days in hospital during last year of life

    days → months

    - 90 not applicable
    - 97 never hospitalized
    - 98 yes, time unknown
    - 99 unknown

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18. Hospitalization continuously from birth to death?

19. Days in hospital prior to last year of life

days ⟶ months

90 not applicable
97 never hospitalized
98 yes, time unknown
99 unknown

20. Hospital of death

__ hospital code number
98 not in hospital

21. Abnormal conditions of pregnancy?

a. edema
b. hypertension
c. albuminuria
d. convulsions
e. hyperemesis
f. anemia
g. threatened abortion
h. placenta previa
i. other

22. Conditions unrelated to pregnancy

a. german measles
b. pulmonary Tbc
c. syphilis
d. other infectious disease
e. operation
f. trauma
g. other

23. Delivery

a. spontaneous
b. manipulation
c. forceps
d. cesarean section
e. anesthesia
f. sedation
g. other

24. Length of gestation (by number of weeks)

25. Single or multiple birth?

26. Birth weight

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27. Nutritional status

00 normal, according to weight
01 malnutrition I according to weight
02 malnutrition II according to weight
03 malnutrition III according to weight
04 normal, without weight
05 malnutrition, slight, without weight
06 malnutrition, moderate, without weight
07 malnutrition, severe, without weight
08 premature - normal nutrition status
09 malnourished, without qualification
10 malnourished, either premature or postmature
99 not specified

28. Weight at approximate time of onset of illness

29. Age at time weight was taken

30. General state of newborn

1 good
2 fair
3 poor
9 unknown

31 Congenital anomalies at birth

1st
2nd
total number

32. Interval from recorded onset of illness to death

33. Age at time of onset of illness

34. How disease started

1 suddenly, abruptly or accidentally
2 progressively or insidiously
9 unknown

35. Hospital of transfer

88 not transferred

36. Laboratory examinations

0 not performed (so stated)
1 performed (results recorded)
9 blank (not specified)

37. X-ray

38. Surgical procedures

0 not performed
1 major
2 umbilical catheter
3 major and umbilical catheter
9 blank

39. Clinical diagnosis (I.C.D.)

1st
2nd
3rd

40. Total number of diagnoses

41. Days in hospital prior to death (with condition which led to death)

42. Autopsy

0 none
1 hospital, complete
2 hospital, partial
3 hospital, incomplete
4 hospital, not specified if complete
5 verification of death
6 medicolegal complete
7 medicolegal other
8 type not specified - complete
9 performed, no specification at all

43. Underlying cause of death from death certificate

44. Underlying cause of death assigned by study group and basis for assignment

0 not relevant
1 clinical history, confirmed by autopsy
2 clinical history, more specific than autopsy, with or without home interview
3 clinical history available, but autopsy only basis for diagnosis
4 autopsy only (no other information available)
5 well defined clinical picture - no autopsy, medical record available
6 questionable clinical picture - no autopsy
7 medical interview at home and autopsy
8 no information, insufficient or unreliable information
9 death certificate only

45. First component and basis for assignment

46. Second component and basis for assignment

47. First, second, and third consequential causes of death and basis for assignment

48. First, ... to fifth contributory causes of death and bases for assignment

49. Nutritional status as part of final diagnosis

50. Congenital anomalies, enumerated, at time of death

51. Preventability of death

0 non-preventable
1 possibly preventable
2 preventable
3 undetermined or unknown

52. Responsibility, primary and secondary, for death

0 family
1 medical
2 community
3 unassignable
9 not applicable

53. Assessment of death certificate

0 none noted
1 error - medical
2 error - clerical
3 error - both medical and clerical

Appendix 4

Childhood Accident Mortality in the San Francisco Bay Area, 1969-1970

Jonathan D. Leavitt, M.D.

CHILDHOOD ACCIDENT MORTALITY IN THE SAN FRANCISCO BAY AREA, 1969-1970

Data from the World Health Organization[1] indicate that accidents account for a significant portion of childhood deaths throughout the industrialized world, and probably throughout the developing countries as well. It has been estimated[2] that fifteen thousand children under the age of 15 years die annually from accidents in the U.S.A.; one-third of these are pre-school children. The State of California has a significant number of childhood accidents according to exhaustive studies done in 1953-1957[3] and 1962-1967[4].

There is increasing evidence that the natural history of childhood accidents varies widely from country to country, and from city to city within these countries. For example, a study in Southwestern Nigeria showed a pattern of childhood accidents quite different from the typical pattern of industrialized countries[5]. Studies done in New York City in 1969[6,7] brought to light a type of childhood accident endemic to that city, with an appreciable mortality, but relatively rare in the western U.S.A. -- falls from heights. A study of swimming pool accidents[8] shows, as would be expected, a wide geographic variation.

This present study of accident mortality in children under five years was undertaken to reveal the pattern of fatal accidents in the San Francisco Bay Area. This is one of the most diverse urban and suburban areas in the U.S.A. in terms of housing, terrain, socio-economic status, and ethnic groups. The population of children under five includes inner-city slum dwellers and inhabitants of elegant hilltop villas. There are children descended from immigrants originating from all the countries of Europe, with a sizable proportion

descended from Africans, Mexicans, Chinese, and Japanese. The landscape includes coastal plains, waterfronts, hills, and sheer cliffs. With such a background it could be expected that childhood accidents in the Bay Area would take many diverse forms.

Prior to the study, four hypotheses were presented for testing:

(1) More than one-tenth of all deaths of children under five years in the San Francisco Bay Area are due to accidents.

(2) Certain kinds of accidental deaths in children are especially prevalent.

(3) Attack rates in children vary significantly according to race and geographical location of residence.

(4) A demographic analysis of childhood accident victims and their families will show significant differences according to the ethnic (i.e., cultural) background of the child.

Materials and Methods

Specific data on childhood mortality due to external causes were obtained in conjunction with the Inter-American Investigation of Mortality in Childhood. This study involved accumulation of data on all deaths of children under five years of age within a designated study area.

County health departments from four counties forwarded death certificates monthly, and these certificates were checked against listings of all deaths provided by the California State Department of Health.

The study area was entirely within the San Francisco-Oakland Standard Metropolitan Statistical Area, and included all of San Francisco County and the urban and more heavily populated suburban areas of three surrounding counties, San Mateo, Contra Costa, and Alameda. The total population covered by the study area (all ages, adults included) was 2,751,000, dispersed over 2625 square miles.

Death certificates were included in the study if the address of the deceased was within the study area, and if the death occurred during the twelve-month period from June 1, 1969 through May 30, 1970 inclusive. Data from medical records and coroners' reports were abstracted onto a questionnaire modified from that drawn up by the Pan American Health Organization for the Inter-American Investigation. Additional data, if needed, were obtained by a pediatrician (the first study director) from medical records and from interviews with the deceased's physician. Underlying causes of death were carefully determined on the basis of all the evidence, and were coded according to the Inter-National Classification of Diseases, Eighth Edition. In some cases the final diagnosis was not that recorded on the death certificate.

Data analysis involved the use of an IBM 1130 Computer and Conversational Computer Statistical System (CCSS). Printouts were obtained for all cases of death due to external cause (ICD code number 800 or higher). Relevant demographic data were obtained and subjected to statistical analysis.

The populations at risk were determined from preliminary 1970 census statistics combined with birth statistics for the study period. These figures were broken down by sex, age, and race; and suitable

denominators for mortality rates were calculated.

Results

Accidental deaths and accident mortality rates per hundred thousand population at risk are summarized in Table I and Table II of the Appendix. There were 898 deaths of children under 5 years in the study area during the twelve-month study period. Of these, 73 were due to external causes, giving an accident mortality rate of 35.7 per hundred thousand population under five years of age.

There were slight differences between mortality rates of males and females, but none of these sex differences was statistically significant.

When mortality rates were compared for whites and non-whites, the rates for non-whites were consistently higher at all ages (Table II). The overall accident mortality rate was 66.1 per 100,000 for non-whites as opposed to 26.6 for whites. This difference is statistically significant to less than the 0.01 level ($t=3.97$).

In the overall population, there is a higher accident mortality rate during the first year of life than during the next four years (61.5 per 100,000 as compared with 29.0). This difference is statistically significant ($t=3.15$).

Table III describes the leading causes of accidental death as determined by the study. (Note that the term "accidental" is herein defined as synonymous with "due to external cause" so that intent, either on the part of the victim or another person, does not exclude a victim from the study.) Deliberate injury to a child resulting in death (homicide) is classified as a separate accident category. Four types of accident (motor vehicle traffic accidents, fires, drownings,

and food aspirations) account for more than half of the total, or 57.5%. "Abuse" cases, including known homicide (7) and "undetermined whether accidentally or purposefully inflicted" (3) account for more than one-eighth or 13.7%.

The incidence of fatal accidents is shown in Table IV according to the month in which the death occurred. There is a peak in July and a low point in May, but there is not distinct seasonal pattern.

Discussion

The data reveal that 73 out of 898 deaths of children under five years, or 8.1% were due to external causes. This is slightly less than the 10% predicted prior to the study.

As was predicted, certain kinds of accidental deaths are especially prevalant, namely, those resulting from motor vehicle traffic accidents, fire, drowing, and food aspiration. However, there does not appear to be an accident type that could be considered a "typical Bay Area accident" in the sense that falls from heights are typical of New York City.

As was predicted, mortality rates varied significantly according to race.

No evidence was elucidated to support the hypothesis that demographic characteristics of accident victims varied according to culture.

Summary

Of 898 children under five years of age who died from June 1, 1969, through May 30, 1970, 73 died as a result of accidents and homicide. Mortality rates were significantly higher for non-whites compared to whites. There was no significant difference in mortality

rates on the basis of sex. Motor vehicle traffic accidents, fires, drownings, and food aspiration were the leading causes of accidental death. Homicides and possible abuse accounted for 13.7% of the total. There was no seasonal pattern.

Table I

Accidental Deaths and Accident Mortality Rates of Children Under Five Years, By Age and Sex, San Francisco Bay Area, 1969-1970 (Rates per 100,000 Population At Risk Given In Parentheses)

Age	Both Sexes	Male	Female
1st - 5th Years	73 36.7	40 38.4	33 32.9
1st Year	26 61.5	13 60.7	13 62.4
2nd - 5th Years	47 29.0	27 32.6	20 25.1

Table II

Accidental Deaths and Accident Mortality Rates of Children Under Five Years, By Age and Race, San Francisco Bay Area, 1969-1970 (Rates per 100,000 Population At Risk Given In Parentheses)

Age	All Races	White	Non-White
1st - 5th Years	73 35.7	42 26.6	33 66.1
1st Year	26 61.5	18 55.1	8 83.5
2nd - 5th Years	47 29.0	24 19.2	23 61.7

Table III

Leading Causes of Accidental Death in Children Under Five Years, San Francisco Bay Area, 1969-1970 (Rates Per 100,000 Population At Risk)

Rank	Cause	Number of Deaths	Rate
1	Motor Vehicle Traffic	13	6.4
2	Fires	11	5.4
3	Drownings	9	4.4
3	Food Aspiration	9	4.4
4	Homicide	7	3.4
5	Mechanical Suffocation	5	2.4
5	Poisonings	5	2.4
5	Iatrogenic	5	2.4
6	Falls	4	2.0
7	Undetermined Whether Accidentally of Purposefully Inflicted	3	1.5
8	Struck By Object	2	1.0

Table IV

Accidental Deaths of Children Under Five Years, By Month of Year, San Francisco Bay Area, 1969-1970 (Percentage of All Accidental Deaths Within the Twelve-Month Period Is Given In Parentheses)

Month	Number of Deaths	Percent
January-December	73	100.00
January	8	11.0
February	7	9.6
March	7	9.6
April	7	9.6
May	2	2.7
June	4	5.5
July	10	13.7
August	7	9.6
September	6	8.2
October	4	5.5
November	8	11.0
December	3	4.1

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Survey Research Center
University of California
Berkeley

Appendix 5

Office # _____

LIVE CHILD SAMPLE

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

California Study

Month of Sample _____

1. Interviewer _____ Date Assigned _____

2. Interviewer _____ Date Assigned _____

Household Number _____ ☐ Primary Schedule ☐ Secondary Schedule

Address _____ Apt. Number _____

Census Tract _____

RECORD OF CALLS

Call No.	Date	Hour	Result of Call	Int. #
1				
2				
3				
4				
5				
6				

Telephone Number _____ ☐ None

By Observation: 1. W 2. N 3. MA 4. Or 5. Other _____

Time Began _____ (a.m.) (p.m.)

3m-10,'69 Rev. (N2799L)

9. OCCUPATION

9a. Would you give me the names of everyone in the household who is currently employed. Please include any child who might be a paperboy or regular babysitter.

9b. What kind of work does he/she do?

9c. What kind of business is that?

9d. How long has he/she done this kind of work?

9e. What was the total family income for the last twelve months?
RECORD INCOME TO NEXT LOWEST THOUSAND DOLLARS. E.G. $4,500 recorded as $4,000.

5 - 7 How many rooms do you have here counting the kitchen, but not counting the bathrooms? (FILL OUT ITEMS 5 - 7. OMIT ITEMS 3 - 4.)

VITAL EVENTS IN PAST TWELVE MONTHS

10a. Has anyone in this family been pregnant in the past year or is there anyone who is presently pregnant?

1. Yes 2. No

FOR EACH WOMAN WHO HAS BEEN OR IS PREGNANT ASK AND RECORD IN ITEM 10 "LIVE BIRTHS"

10b. Who is that?

10c. How many times have/has you/she been pregnant this past year?

10d. Is/are _____ presently pregnant?

ASK FOR EACH PREGNANCY:

10e. Was that baby born in good health?

FOR ALL LIVE BIRTHS, RECORD NAME AND DATE OF BIRTH FROM ENUMERATION.

11a. Has anyone in this family died since DATE (1 year prior to interview)?
FOR EACH DEATH ASK AS NECESSARY AND RECORD IN ITEM 11, Deaths:

11b. What was (his)(her) name?

11c. How old was (he)(she)?

11d. Was that a (boy)(girl) (man)(woman)?

11e. Exactly when (date) did (he)(she) die?

11f. Did (he)(she) die at home or in a hospital or elsewhere? What hospital?

13. RECORD SOURCE OF INFORMATION

IF THERE ARE NO CHILDREN IN HOUSEHOLD UNDER FIVE TERMINATE INTERVIEW.

INTERVIEWER START HERE

Intro. - Hello. I'm from the Survey Research Center. We're doing a study of families in North and South America. May I ask you some questions?

8. ENUMERATION

8a. First I'd like to get an idea of who lives in this house/apt. Would you start with the adults giving me the name of the head of the household first.

8b. I'd like the names of the children in order of age beginning with the oldest.

8c. Is there anyone else who usually lives here like a roomer or a boarder?

8d. How is _____ related to the head of this household?
Person

8e. His/her age? (RECORD SEX)

8f. Is _____ now married, widowed, separated or never married?
Person

IF OTHER THAN A SIMPLE FAMILY WITH NO CHILDREN OVER 14 ASK:

8g. Do any of the people I have listed live or eat separately from the rest of the household? 1. Yes 2. No SKIP TO Q. 8j

↓
IF YES:

8h. Who is that? (Person Numbers _)

8i. Do you usually prepare and share food together or separately.

1. Together 2. Separately

☐ PRIMARY FAMILY ☐ SECOND SCHEDULE(s) NEEDED

FOR EACH PERSON LISTED IN THE FAMILY ASK:

8j. What was the highest year in school _____ completed?

(INDICATE AS "TOTAL YEARS" E.G. 2 YEARS COLLEGE=14 YEARS.)

IF R INDICATES EDUCATION BEYOND SECONDARY SCHOOL ASK:

8k. Is/was that a Trade, Technical or Business school?

CODE THIS AS: (P) = PRIMARY = 1-8 (S) = SECONDARY = 9-12
T = TECHNICAL (Business school, Trade school, etc.)
U = J.C., COLLEGE or UNIVERSITY.

DETERMINE # OF YEARS COMPLETED IN LAST TYPE OF SCHOOL ATTENDED.

81. How long have you lived in _____.
Name of City

IF LESS THAN FIVE YEARS ASK:

8m. Did you live on a farm before moving here? (PROBE: TO DETERMINE HOW MANY OF LAST FIVE YEARS WERE URBAN AND HOW MANY RURAL.)

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California Study

Sample - Page 1

1. Household no._____

2. Address _____ Sector or Division _____

Census Tract _____

3. Neighborhood	4. Type of housing	5. Number of rooms	6. Water: Piped water Other Inside Outside	7. Toilet: Flush Other None

8. ENUMERATION

Indiv. No.	Name	Relation to head	Date of birth*	Age	Sex	Marital status	Education			Length of residence		
							Total years	Last Type	Last Years	Community	Last 5 years Urban	Last 5 years Rural
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10.												
11.												
12.												

*Enter date of birth for children under 6 years.

9. OCCUPATION

Indiv. no.	Name	Currently employed	Occupation	Kind of Business	Time in Occupation

9a. Family Income_____

VITAL EVENTS IN PAST 12 MOS.

10. Live births, fetal deaths and pregnancies of each woman (15-49 years)

Indiv. no.	Name	Number of Pregnancies	Abortions and stillbirths		Live Births		Pregnant now?
			Number	Dates	Dates	Names	

Name of deceased	Age	Sex	Date	Home Hospital	Name of hospital	Other

10a. Source of information:

Name _____ Indiv. no._____ Date_____ Interviewer_____

IF MORE THAN ONE MOTHER WITH ELIGIBLE STUDY CHILD IN HOUSEHOLD USE SEPARATE FORMS FOR EACH. NUMBER ADDITIONAL FORMS WITH SAME ID NUMBER AS PRIMARY FORM.

14. DATA ON PARENTS

If father and mother listed in enumeration, transcribe individual number, and ask date of birth. If father or mother not listed in enumeration, complete appropriate line of item 14. Do not use this space for stepparents or foster parents. RECORD "unknown" WHERE APPROPRIATE.

15. PREGNANCY HISTORY OF (NATURAL) MOTHER

15a. Was _____ your (first/second . . .) pregnancy?
OLDEST CHILD, 2ND . . .

1. Yes
↓
IF YES:

RECORD CHILD'S NAME, AGE AND SEX FROM ENUMERATION AND ASK ABOUT NEXT CHILD. IF NO MORE CHILDREN DETERMINE IF THERE HAVE BEEN ANY OTHER PREGNANCIES. IF SO ASK Q. 15b.

2. No
↓
IF NO:

15b. What happened to that (1st, 2nd, etc.) pregnancy? PROBE IF NECESSARY: Miscarriage, stillbirth, child died, etc. RECORD THIS RESPONSE ON CHART UNDER FULL NAME. IF CHILD DIED ASK FOR NAME AND SEX AND AGE AT DEATH.

QUESTION 15a. WILL BE REPEATED FOR EACH OF THE RESPONDENT'S CHILDREN LISTED IN THE ENUMERATION, SUBSTITUTING THE NAMES OF SECOND, THIRD CHILD, ETC., AND THE APPROPRIATE PREGNANCY NUMBER AS NECESSARY. AFTER YOU HAVE DETERMINED EACH OF THE RESPONDENT'S PREGNANCIES GO TO QUESTION 15c.

15c. Are you (mother) presently using any method of birth control?

IF YES:

15d. What method are you using?

THE FOLLOWING QUESTIONS ARE TO BE ASKED FOR EACH STUDY CHILD.

16 - 19 On schedule. (OMIT BIRTH CERTIFICATE NUMBER.)

20. POSTPONE TO END OF INTERVIEW

Household No. _____

Name of child	Individual No.	Date of birth	Sex	Age yrs. mos. days

14. DATA ON PARENTS

Ind. No.	Name	Live here?	Date of birth	Age	Marital Status	Education	Employed now?	Occupation	Business

15. PREGNANCY HISTORY OF MOTHER

RECORD ONCE ONLY FOR EACH MOTHER OF A STUDY CHILD

Order	Indiv. No.	Date pregnancy ended	Abortion?	Stillbirth?	Live Births			
					Name of Child	Sex	Living now?	Age at death
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

15c. Mother's current use of contraception. Informant not mother ☐ Mother not using contraception ☐
Mother is sterile ☐ Mother using contraception ☐

15d. Type (check) Oral (pill) ☐ I.U.D.("Coil", "Loop") ☐ Rhythm ☐
Diaphragm ☐ Jellies, creams, foam, etc. ☐ Injections ☐
Condom ☐ Abstinence ☐ Withdrawal ☐
Other ☐ _____

THE FOLLOWING QUESTIONS ARE TO BE ASKED FOR EACH STUDY CHILD

16. Was the mother of this child seen by physician, or in a clinic or hospital during her pregnancy with this child?
Yes ☐ No ☐ Unknown ☐
If yes, name of physician, clinic or hospital _____ Dates _____
Reason _____
Months pregnant at first visit? _____ Number of visits _____

17. Length of pregnancy _____ months Unknown ☐

18. Where was this child born?
Home ☐ Hospital ☐ Other ☐
Hospital name and city where born _____

19. Who attended birth? Doctor ☐ Midwife ☐ Other ☐ _____ Birth Certificate No. _____

20. Weight and arm circumference: Weight: At birth _____ Present _____
Arm circumference: At birth _____ Present _____

21 - 22 On schedule

23. Omit

24a. What other foods did you give the baby?

CHECK FOODS NAMED

24b. At what age did you start to give _____? How often did you give it? ASK FOR EACH FOOD CHECKED.

24c. Did you ever give _____? ASK FOR ALL FOODS NOT CHECKED. IF "YES", REPEAT QUESTION 24b.

25 - 26 On schedule

27a. Has _____ had any shots yet?

27b. How about DPT?

27c. How about polio vaccine?

27d. How about the measles vaccine?

27e. How about mumps?

27f. Any others?

28a. Has _____ had any of the following illnesses? CIRCLE LETTER ON CHART.

a. German measles? (three-day measles) b. red measles c. chicken pox

d. whooping cough e. mumps

FOR ALL CIRCLED, ASK:

28b. How old was _____ when (he)(she) had _____? RECORD AGE IN MONTHS.

29. On schedule. RECORD STARTING WITH MOST RECENT.

29a. Is _____ covered by health insurance?

1. Yes 2. No

↓

IF YES

29b. What kind of insurance is it?
Is it Kaiser, Blue Cross-Blue Shield or some other private insurance company?

(IF OTHER SPECIFY)

30. On schedule

31. ASK BIRTH WEIGHT. IF CHILD OVER 1 WEEK, WEIGH AND MEASURE ARM CIRCUMFERENCE. RECORD.

ASK FOR TELEPHONE NUMBER. THANK RESPONDANT.

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California Study

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Household no._____

Name of child	Individual no.	Date of birth	Sex	Age___yrs.___mos.___days

21. Did you breast feed the child? Yes☐ When did weaning start? Age____months Reason_____

When did weaning end? Age____months

No ☐ Why not_____Unknown ☐

22. Principal Milk Formula. Was formula used? No☐ Yes☐ Age started____months or _____days.

Times per day_____

Type of milk_____Proportion of milk to water: milk____ water_____

Was use of milk continued? Yes☐ No☐

23. Was other weaning food used?_____Was weaning food continued?_____

24. FRUITS:_____mos. Times per week ☐	JUICES:_____mos. Times per week ☐	CEREALS:_____mos. Times per week ☐	LEGUMES:_____mos. Times per week ☐	ROOTS, TUBERS:___mos. Time per week ☐
LEAFY VEGETABLES:___mos. Times per week ☐	EGGS:_____mos. Times per week ☐	POULTRY:_____mos. Times per week ☐	MEAT:_____mos. Times per week ☐	FISH:_____mos. Times per week ☐

25. At what age (in months) did child do the following: A) raise head? ___ b)seat self? ___ c)stand alone?___

d)walk alone? ___ e)control bladder? ___ f)control bowels? ___ g)feed self? ___

26. Who cares for child most of day: Mother ☐ Grandmother ☐ Sibling (15 yrs. +) ☐ Sibling (-15yrs.) ☐

Other relative ☐ Maid ☐ Day Care ☐ Other ☐

27. Has child been immunized? Yes ☐ No ☐ If yes, which vaccines?_____

Mumps vaccine? Yes☐ No☐ Measles vaccine? Yes ☐ No ☐

28. At what age in months did child have following: a) German measles?_____ b) measles?_____ c) chickenpox?_____

d) whooping cough?_____ e) mumps? _____

29. During the last year, has this child been attended by a physician or in a clinic or hospital? Yes☐ No☐ Unknown☐

Name of physician, clinic or hospital	Type*	Dates	Days in hospital	Reason	Number of visits

*Indicate whether clinic(health center or hospital) C, inpatient in hospital H, practicing physician P, emergency E, dentist D, well child visit W.

29a. Health insurance or other coverage No ☐ Yes ☐

Type Medi-Cal (Welfare, Title XIX) ☐ Kaiser ☐ Blue Cross-Blue Shield ☐

Other Private insurance ☐ Other ☐ _____

30. Source of information: Mother ☐ Father ☐ Other ☐ _____

Date_____ Interviewer_____

NON-INTERVIEW INFORMATION

Reason for non-interview in occupied dwelling unit:

Check one:

- ☐ No one ever at home in four calls.
- ☐ Respondent never at home in four calls; other household member seen.
- ☐ Direct refusal. (Respondent or other household member said they would not cooperate.) INDICATE REASON IF GIVEN: _____
- ☐ Indirect refusal. Always "too busy," two or more broken appointments, etc. EXPLAIN: _____
- ☐ Inaccessible respondent and no alternative available. EXPLAIN (e.g.: out of town for extended stay, hospitalized, too ill to be interviewed): _____
- ☐ Other. EXPLAIN: _____

Result of attempted conversion by second interviewer:

Interviewer# _____

- ☐ Refusal. INDICATE REASON IF GIVEN: _____
- ☐ Could not find respondent at home in two calls.
- ☐ Inaccessible respondent.
- ☐ Other. EXPLAIN: _____

Appendix 6

Variables Coded From Live Child Questionnaire

I. Household

A. Facilities

1. Number of rooms

2. Plumbing

a. Water
- piped water inside
- piped water outside
- other
- unknown

b. Toilet
- flush
- none
- other
- unknown

B. Members

1. Race

2. Family income

3. Number of deceased persons

(for 1st deceased person)

a. Age, Sex, Year of death

b. Place of death
- hospital
- home
- other
- unknown

4. Total number of persons in household

5. For each member of household

a. Age

b. Sex, Marital status

(if female)

1) Total number of pregnancies this last year
2) Number of livebirths
3) Number of stillbirths and abortions
4) Is woman pregnant now?

c. Education

1) Years completed

2) Last type of education and years in it

primary
secondary
technical (business, trade)
college or university
other (incl. music school, bible school, home school)
none
unknown
preschool

d. Length of residence in community

e. Occupation and length of time in it

professional, technical, managers
clerical, sales
skilled craftsmen, foremen
semi-skilled, operatives
service
unskilled
military service
unknown

f. Relation to household

head of household
spouse
child, stepchild
grandchild
parent, parents-in-law
other relative
other, non-relative
no answer, unknown

II. Study Children in Household

A. Number for each child eligible

1. Age, sex, birthdate

2. Is father in household

yes
no
dead
unknown

3. Father's age, marital status, education, occupation

4. Is mother in household?

   yes
   no
   dead
   unknown

5. Mother's age, marital status, education, occupation

6. Pregnancy history of mother

   a. Total number of pregnancies

   b. Number of abortions and stillbirths

   c. Number of liveborn children

      number of males
      number of females

   d. Number of liveborn children who subsequently died

   e. Is mother using contraception?

   f. Did mother receive medical attention during pregnancy with study child?

      1) Where

         public hospital or clinic, incl. military
         private doctor or group
         Kaiser
         unknown

      2) Reason for visit

         normal prenatal care
         antepartum problem
         unknown, don't remember
         other

      3) Months pregnant at first visit

         number of visits

      4) Length of pregnancy (in months)

III. Study Child Data

   A. Birth information

      1. Where was child born

      2. Who attended birth

      3. Weight at birth

B. Feeding

1. Milk products

a. Breast fed?

yes
no
unknown

(reason not breast fed)

health of mother, incl. mental
desire of mother
no milk or poor quality
health of child, incl. prematurity
unknown
other

b. When weaning started and ended

c. Was formula used?

1) Age at which started

2) Formula feedings per day

number
7 or more
not applicable, no formula
not known or given on demand

d. Type of milk used

cow
evaporated
prepared formula
special (soy milk, goat milk)
not applicable
unknown

1) Was use of milk continued?

2. Other Foods

fruits, juices, cereals
leafy vegetables, roots, tubers
legumes, eggs, poultry, meat, fish

a. Age when given

b. Times per week

c. Was information given "spontaneously" or was "probing" necessary

3. Who cares for child?

mother
grandmother
sibling (15 yrs. or over)
sibling (under 15 yrs.)
other relative
maid
day care, incl. nursery school
other, incl. neighbor
no answer

C. Health Care

1. Has child been immunized against:

a. DPT
b. polio vaccine
c. smallpox
d. rubella
e. measles
f. mumps
g. other vaccine, incl. flu shot, typhoid

2. Age at which child had:

a. chickenpox
b. whooping cough
c. mumps
d. roseola

3. Health insurance or other coverage

yes
no
unknown

a. Type

Medical
Welfare
Kaiser
Blue Cross
private insurance
other
unknown

D. Child's recent medical history

1. Medical attention during past year

yes
no
unknown

a. Number of times

(for 1st visit)

1) Type of care

clinic, hospital or health center
inpatient in hospital
practicing physician
emergency
dentist
well-child visit
unknown
no answer

2. Reason

well-baby care, incl. immunizations
emergency care, incl. stitches
illness, incl. rash, cold, infection
dental
unknown
no answer

3. Number of visits

4. Days in hospital

number
none
unknown

(for 2nd time attended)

type of care
reason
number of visits
days in hospital

E. Source of information

mother
father
mother and father together
other
unknown

Appendix 7

Ages of Mothers of Deceased Children
at Birth of Child by County

	Mother's Age			
County	High	Low	Mean	Known Cases
Alameda	44	14	24.6	349
Contra Costa	41	14	23.9	158
San Mateo	45	16	25.7	133
San Francisco	44	15	25.1	223

Appendix 8

Ages of Fathers of Deceased Children at Birth of Child by County

	Father's Age			
County	High	Low	Mean	Known Cases
Alameda	56	16	27.5	332
Contra Costa	50	17	27.2	148
San Mateo	52	17	29.2	209
San Francisco	71	19	29.4	125

Appendix 9

Birth Orders of Deceased Children by County

County	High	Low	Mean	Known Cases
Alameda	12	1	2.5	350
Contra Costa	9	1	2.3	153
San Mateo	12	1	2.4	130
San Francisco	12	1	2.5	217

Appendix 10

Number and Percent of Abnormal Conditions Unrelated to Pregnancy During Pregnancy With Study Child

Conditions	Neonatal		Postneonatal		Preschool	
	#	%	#	%	#	%
german measles	3	0.5	1	0.5	0	-
tuberculosis	0	-	0	-	0	-
syphilis	3	0.5	0	-	0	-
other infections	1	0.2	1	0.5	0	-
operation	7	1.2	0	-	0	-
trauma	2	0.4	2	0.9	0	-
All Deaths	570		213		115	

Appendix 11

Number and Percent of Conditions Grouped as Toxemia and As Antepartum Hemorrhage

Conditions	Neonatal		Postneonatal		Preschool	
	#	%	#	%	#	%
Toxemia						
edema	18	3.2	5	2.3	3	2.6
hypertension	22	3.9	2	0.9	2	1.7
albuminuria	3	0.5	2	0.9	1	0.9
convulsions	0	-	0	-	0	-
Antepartum Hemorrhage						
placenta previa	18	3.2	1	0.5	1	0.9
threatened abortion	19	3.3	4	1.9	0	-
All Deaths	570		213		115	

Appendix 12

Incidence of Low Birth Weight Among Mothers
With Abnormal Conditions Related To Pregnancy

Conditions	Birth Weight					
	2500 grams		2501 grams		Total	
	#	%	#	%	#	%
toxemia	19	44.2	24	55.8	43	100.0
anemia	15	88.2	2	11.8	17	100.0
antepartum hemorrhage	36	87.8	5	12.2	41	100.0

Appendix 13

Initiation of Prenatal Care Among Mothers of Deceased Children by Race

Race	Trimester Care													
	First		Second		Third		Care Time Unknown		No Care		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
White	353	58.0	135	22.2	30	4.9	27	4.4	16	2.6	48	7.9	609	100.0
Black	101	41.9	82	34.0	10	4.2	3	1.2	26	10.8	19	7.9	241	100.0
Other	21	43.7	14	29.2	1	2.1	3	6.3	4	8.3	5	10.4	48	100.0
Unknown	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total	475	52.9	231	25.7	41	4.6	33	3.7	46	5.1	72	8.0	898	100.0

Appendix 14

Initiation of Prenatal Care Among Mothers of Deceased Children
by Age of Mother

Maternal Age	Trimester Care													
	First		Second		Third		Care Time Unknown		No Care		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
14 - 19 yrs.	81	44.8	61	33.7	14	7.7	5	2.8	12	6.6	8	4.4	181	100.0
20 - 29 yrs.	306	60.1	123	24.2	18	3.5	17	3.3	24	4.7	21	4.2	509	100.0
30 - 34 yrs.	60	54.5	25	22.7	4	3.6	7	6.4	6	5.5	8	7.3	110	100.0
35 yrs. & over	27	42.2	22	34.4	5	7.8	2	3.1	4	6.2	4	6.2	64	100.0
Unknown	1	2.9	0	-	0	-	2	5.9	0	-	31	91.2	34	100.0
Total	475	52.9	231	25.7	41	4.6	33	3.7	46	5.1	72	8.0	898	100.0

Appendix 15

Initiation of Prenatal Care Among Mothers of Deceased Children by Maternal Parity

Parity	Trimester Care: First		Second		Third		Care Time Unknown		No Care		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Para 1	159	55.2	76	26.4	17	5.9	8	2.8	10	3.5	18	6.2	288	100.0
2	142	57.5	63	25.5	11	4.5	6	2.4	15	6.1	10	4.0	247	100.0
3	93	57.8	40	24.9	6	3.7	7	4.3	5	3.1	10	6.2	161	100.0
4	40	51.9	23	29.9	2	2.6	3	3.9	5	6.5	4	5.2	77	100.0
5+	29	37.2	27	34.6	5	6.4	1	1.3	10	12.8	6	7.7	78	100.0
unknown	12	25.5	2	4.3	0	-	8	17.0	1	2.1	24	51.1	47	100.0
Total	475	52.9	231	25.7	41	4.6	33	3.7	46	5.1	72	8.0	898	100.0

Appendix 16

Initiation of Prenatal Care Among Mothers of Deceased Children
by Marital Status of Mother

Marital Status	Trimester Care: First		Second		Third		Care Time Unknown		No Care		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
married to father of deceased child	407	59.9	161	23.7	21	3.1	30	4.4	22	3.3	38	5.6	679	100.0
single	33	34.4	34	35.4	13	13.5	0	-	12	12.5	4	4.2	96	100.0
other	12	44.5	8	29.6	0	-	0	-	2	7.4	5	18.5	27	100.0
unknown	23	23.9	28	29.2	7	7.3	3	3.1	10	10.4	25	26.1	96	100.0
Total	475	52.9	231	25.7	41	4.6	33	3.7	46	5.1	72	8.0	898	100.0

Appendix 17

Initiation of Prenatal Care Among Mothers of Deceased Children
by Occupation of Father

Father's Occupational Group	Trimester Care													
	First		Second		Third		Care Time Unknown		No Care		Unknown		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
I	149	68.7	42	19.4	4	1.8	9	4.1	3	1.4	10	4.6	217	100.0
II	150	58.6	55	21.5	13	5.1	10	3.9	15	5.8	13	5.1	256	100.0
III	73	44.5	57	34.8	16	9.8	3	1.8	10	6.1	5	3.0	164	100.0
unknown	103	39.5	77	29.5	8	3.1	11	4.2	18	6.9	44	16.8	261	100.0
Total	475	52.9	231	25.7	41	4.6	33	3.7	46	5.1	72	8.0	898	100.0

Appendix 18

Initiation of Prenatal Care Among Mothers of Deceased Children
by Type of Abnormal Condition Related to Pregnancy

Abnormal Conditions Related to Pregnancy	Trimester Care											
	First		Second		Third		Care Time Unknown		No Care		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
toxemia	21	48.8	17	39.5	2	4.7	2	4.7	1	2.3	43	100.0
anemia	8	47.0	7	41.2	0	0.0	0	0.0	2	11.8	17	100.0
antepartum hemorrhage	19	50.0	12	31.6	1	2.6	3	7.9	3	7.9	38	100.0

Appendix 19

Number and Percent of Cases of Sudden Infant Death Syndrome Among Deceased Children by Race

Cause of Death	RACE							
	White		Black		Other		Total	
	#	%	#	%	#	%	#	%
Sudden Infant Death	41	71.9	15	26.3	1	1.8	57	100.0
All Other Deaths	568	67.5	226	26.9	47	5.6	841	100.0
Total	609	67.8	241	26.8	48	5.4	898	100.0

Appendix 20

Number and Percent of Cases of Sudden Infant Death Syndrome Among Deceased Children by Sex

Cause of Death	SEX					
	male		female		total	
	#	%	#	%	#	%
Sudden Infant Death	34	59.6	23	40.4	57	100.0
All Other Causes	504	59.9	337	40.1	841	100.0
Total	538	59.9	360	40.1	898	100.0

Appendix 21

Number and Percent of Cases of Sudden Infant Death Syndrome
Among Deceased Children by Maternal Parity

Cause of Death	PARITY 1		2		3		4		5+		Unk.		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Sudden Infant Death	18	31.6	16	28.1	11	19.3	5	8.8	6	10.5	1	1.7	57	100.0
All Other Deaths	269	32.0	231	27.5	151	18.0	72	8.5	72	8.5	46	5.5	841	100.0
Total	287	32.0	247	27.5	162	18.0	77	8.6	78	8.7	47	5.2	898	100.0

Appendix 22

Number and Percent of Cases of Sudden Infant Death Syndrome
by Winter and Summer Months

Cause of Death	Season					
	winter		summer		total	
	#	%	#	%	#	%
Sudden Infant Death	35	61.4	22	38.6	57	100.0
All Other Deaths	423	50.3	418	49.7	841	100.0
Total	458	51.0	440	49.0	898	100.0

Appendix 23

Probability Sample of Live Children of Population of Study Area by Race, Age, and County of Residence

Age	County				
	Alameda	Contra Costa	San Mateo	San Francisco	Total
White					
under 1 year	49	28	7	18	102
1 to 4 years	165	126	62	62	415
5 to 12 years	429	317	159	152	1,057
13 to 19 years	354	278	180	143	955
20 to 24 years	276	148	111	152	687
25 to 34 years	405	241	147	289	1,082
35 to 44 years	342	250	153	220	965
45 to 64 years	754	498	323	535	2,110
65 years & over	404	134	98	306	942
unknown	19	22	10	19	70
Total	3,197	2,042	1,250	1,896	8,385
Black					
under 1 year	18	3	0	7	28
1 to 4 years	78	16	1	22	117
5 to 12 years	146	46	18	65	275
13 to 19 years	124	27	9	42	202
20 to 24 years	52	9	5	35	101
25 to 34 years	84	22	13	64	183
35 to 44 years	83	15	3	59	160
45 to 64 years	120	23	23	89	255
65 years & over	41	2	8	18	69
unknown	4	4	1	7	16
Total	750	167	81	408	1,406
Other Races					
under 1 year	4	1	0	7	12
1 to 4 years	5	4	0	16	25
5 to 12 years	27	5	9	47	88
13 to 19 years	11	4	6	49	70
20 to 24 years	12	2	0	36	50
25 to 34 years	22	13	4	45	84
35 to 44 years	12	[illegible]	5	38	62
45 to 64 years	28	11	11	51	101
65 years & over	5	2	4	13	24
unknown	1	0	0	7	8
Total	127	49	39	307	524
Total Population					
under 1 year	71	32	7	32	142
1 to 4 years	248	146	63	100	557
5 to 12 years	602	368	186	264	1,420
13 to 19 years	489	309	195	234	1,227
20 to 24 years	340	159	116	223	838
25 to 34 years	511	276	164	398	1,349
35 to 44 years	437	272	161	317	1,187
45 to 64 years	902	532	357	675	2,466
65 years & over	450	138	110	337	1,035
unknown	24	26	11	33	94
Total	4,074	2,258	1,370	2,613	10,315